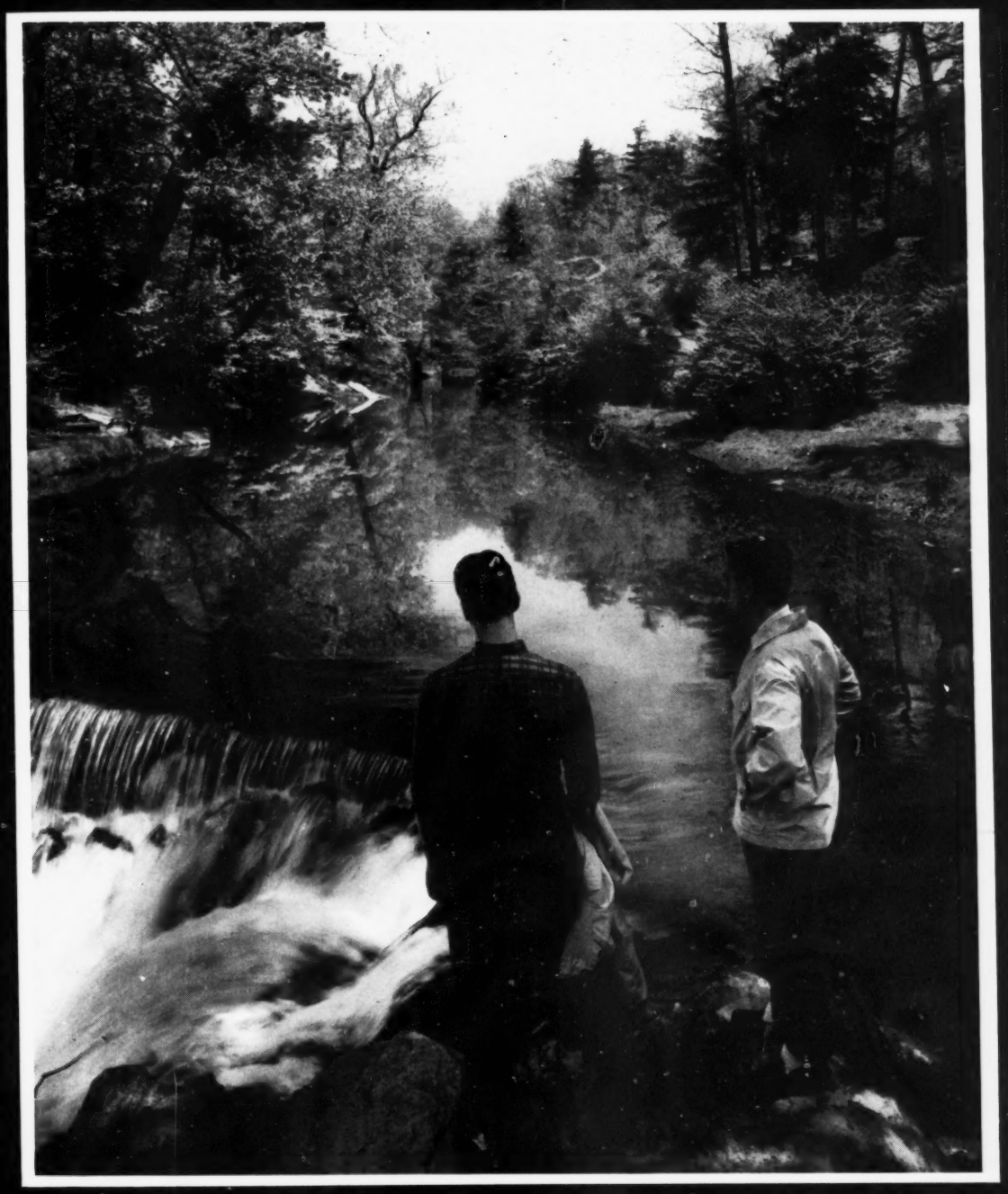

THE GARDEN JOURNAL

THE NEW YORK BOTANICAL GARDEN

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DOROTHY EBEL HANSELL
Editor

CALENDAR

September 15-17, 1961. Penn-Jersey District Meeting and Rose Show at the Hotel Suburban and the Colonial Life Insurance Company Building, Prospect Street, East Orange, New Jersey.

October 20-22, 1961. Eighteenth Annual Meeting and Show of the National Chrysanthemum Society, Inc., U. S. A., Garden City, Long Island.

October 25-27, 1961. Sixteenth Annual American Horticultural Congress, Northampton, Mass.

November 3, 1961. Chrysanthemum Show opens in the Conservatory of The New York Botanical Garden.

December 7, 1961. Holiday House Tour, sponsored by the Volunteer Associates of The New York Botanical Garden.

December 14, 1961. Theater Benefit, "Gay Life" at the Shubert Theater, sponsored by the Volunteer Associates of The New York Botanical Garden.

January 4, 11, 18, 25, 1962. Downtown Lecture Series, sponsored by the Volunteer Associates of The New York Botanical Garden.

April 27-May 7, 1962. Floralies, International Horticultural Exposition under auspices of Société d' Horticulture and Jardin Populaires de France in Valenciennes, France.

August 31-September 8, 1962. Sixteenth International Horticultural Congress, Brussels, Belgium.

April 26-October 1, 1963. International Horticultural Exposition, Hamburg, West Germany.

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While every effort is made by the Editor to avoid errors, the ultimate responsibility for all statements rests with the authors.

CREDIT FOR ILLUSTRATIONS

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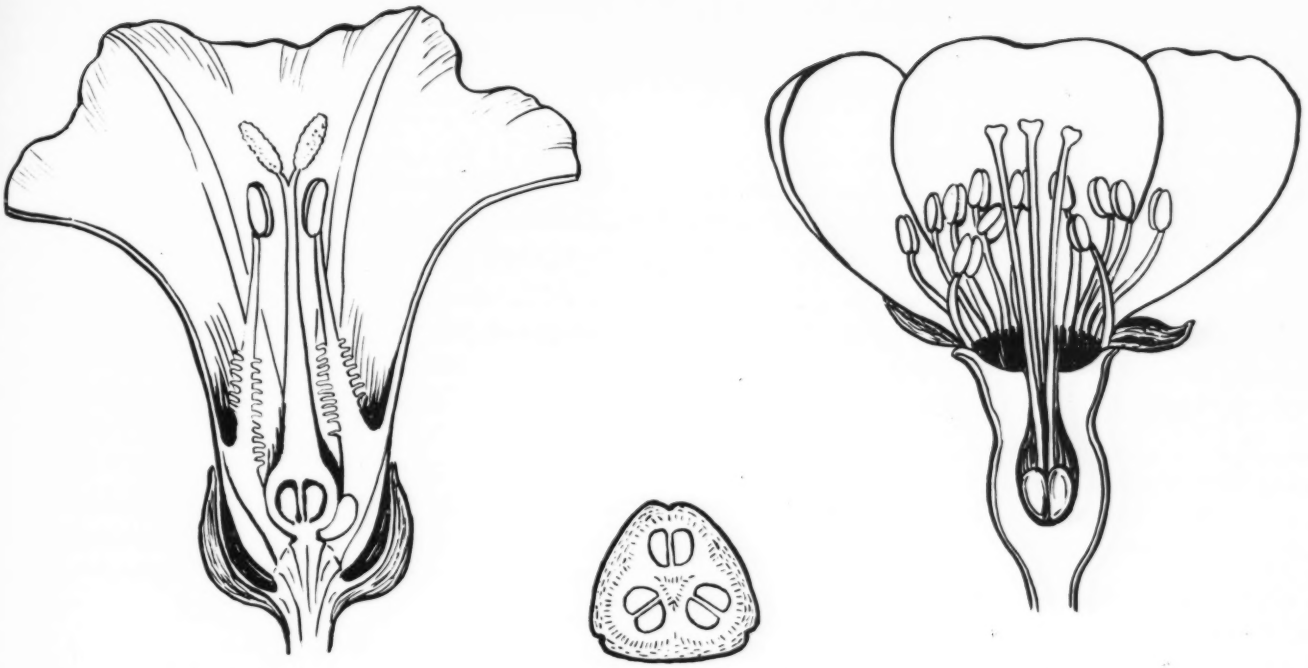


Contour: Left. Longitudinal section of a *Convolvulus* flower. Center. Cross section of a tulip fruit. Right. Longitudinal section of a pear blossom.

DESIGN IN FLOWERS AND PLANTS

By NATALIE H. DAVIS

Before coming to the University of Illinois as staff artist in the Botany Department, Miss Davis free-lanced in New York in the field of botanical and horticultural illustration, working for publishers of books and magazines, both scientific and popular.

At the University of Illinois a technique of painting in water color was developed for careful studies of flower and plant parts, greatly enlarged, and these illustrations, or "charts," are used as teaching aids in the botany lectures. From the artist's angle, this opportunity to study plant structure and microscopic parts closely turned into a voyage of personal discovery of ever-present design, and one result was to give talks to garden clubs around Chicago and other cities. This is the basis for those talks.

A hobby of wood-block printing took Miss Davis to Japan last summer to study the Japanese method of block printing.

THE IDEA THAT nature is the great designer is hardly new to any of us; even a school child is familiar with the exquisite and infinitely varied designs in snow crystals. But few people beside the botanist and botanical artist know the incredible wonder and beauty of the inner structure of flowers.

Flowers and plants have been used as design through the ages, ever since man decorated anything. The artist seems to have had a passion for flowers, and after long use as a design motif the flower or plant often became a national emblem. The Egyptian lotus is one of these—the water-lily which to the Egyptians had much sacred symbolism. With its roots in the mud and its exquisite blossom rising above the surface of the water and daily opening to the sky at the bidding of the sun, it became a symbol of the sun, of the spiritual life and of immortality. Bouquets of lotus blossoms were given to guests at funerals. As the national flower of Egypt the lotus motif was used superbly in architecture, both carved and painted; it was wrought in jewelry, and reproduced in the decoration of pottery. Probably because of its adaptability as a design motif it has also been used in India, China, and Japan, in each taking on the individual nation's symbolism.

The beauty of leaf design also has long been recognized. In Romanesque architecture of the eleventh century, column capitals were sometimes adorned with sculptured leaves which were carved with such fidelity that they are acceptable even to the botanist. Those of the cathedral at Cluny are a notable example. The acanthus, immortalized by the Greeks, is very familiar in architectural details right up to the present day. There is a legend that the source of the design motif of the well-known Corinthian capital was the acanthus leaf in the center of which it was customary to place a funeral offering. Whether or not this is true, it was natural to use the leaves of this handsome plant which grows profusely in the Mediterranean region. After hundreds of years the acanthus motif had a special renaissance at the time of Louis XIV, XV, and XVI in France; it appears in architecture, furniture and decorative objects of every kind.

The French fleur de lis also has had a long history. There probably will always be an argument as to whether the lily or the iris was the origin of this emblem. However, the design seems to point to the iris; and it is said that when a Frankish king was proclaimed, he was elevated on a shield, and a spray of blooming "marsh lily," another name for one of the irises, was placed in his hand. The fleur de lis has been used by every kind of artist and craftsman, in heraldry, textiles, furniture, and jewelry. It has seen many changes and adaptations, and it is still an unusually lovely emblem. This is also true both of Turkey's tulip, which is seen slightly stylized in porcelain and fabrics, and of the pomegranate, a fruit that is mentioned frequently in the Bible as adorning priests' robes and architectural columns. It is said to have been the source for the design of Solomon's crown. The tulip ultimately became the national flower of Turkey and the pomegranate that of Spain.

The Aim of the Botanist and Botanical Artist: To Understand Nature

In all this use of the plant as a source of design in decoration, nature is being adapted to man's will and to that degree exploited. In botany, on the other hand, and in botanical illustrating, the aim is to discover the ways of nature —to know the structure and functions of the plant, and its usefulness. In so doing the seeker is also struck by the beauty of design.

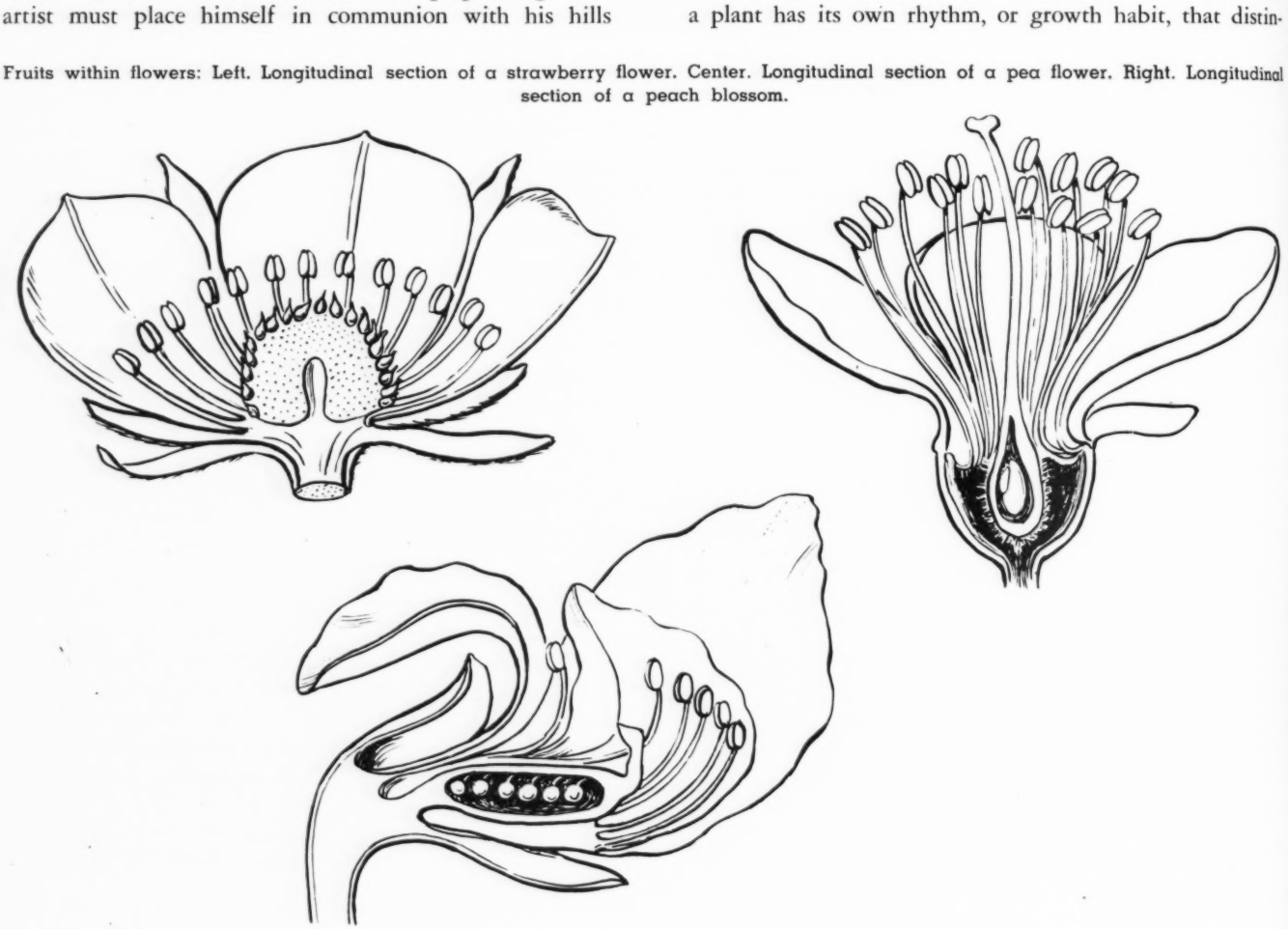
The botanical artist needs to have the Oriental attitude toward nature. Kuo Hsi writes on landscape painting, "The artist must place himself in communion with his hills and with his streams." In like manner the ancient Chinese painter of flowers (and the Chinese, perhaps, are considered the best nature painters of all time) sought to enter into the life of the plant, to be an interpreter of nature. We are told their method of work was to make countless sketches of a flower or plant, from all angles, and at all times of day, until they thoroughly understood the plant; then to discard all sketches and make the final drawing or painting by heart, by their inspired memory and understanding. The result was a work of art of extraordinary vitality, not just a reproduction. It was the eternal truth of that flower.

Countless legends tell of the ability of Chinese artists to infuse their paintings with life. One legend tells about an artist's young apprentice who had been disobedient or negligent in his duties; for punishment his master bound him with ropes to a stake. As he wept over his plight, his tears mingled with the soil at his feet, and with his toe he drew a mouse of such realism and vitality that it came to life, gnawed the rope that bound the boy, and set him free.

Method of Work of the Botanical Artist

In order to portray detail and vitality, the first requirement in a botanical artist is that he or she have a genuine passion for flowers, especially since infinite patience is often required. For instance, a floret must be dissected so that no damage is done to the smallest structures. Pains must also be taken to secure fresh material, because a flower or a plant has its own rhythm, or growth habit, that distin-

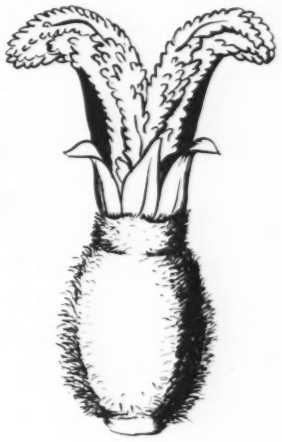
Fruits within flowers: Left. Longitudinal section of a strawberry flower. Center. Longitudinal section of a pea flower. Right. Longitudinal section of a peach blossom.



guishes it from any others. This is the architecture of the plant, and much of this structural beauty is lost when the plant is faded, or even a little wilted, or when it is seen only two-dimensionally, as in a pressed specimen. An experienced artist can reconstruct a plant from an herbarium specimen, but the result is inevitably a bit wooden and stiff. Many sketches should therefore be made in order that the live material may be recorded for reference throughout the entire process of painting or other illustrating.

Flowers and plants are restless models: a leaf bends, a petal curls, and in no time the whole structure has a new aspect. In the face of such danger it is a temptation to use a camera, yet the camera is undoubtedly responsible for the lack of outstanding flower illustrations today. Such superb work along some lines is done with the camera that the artist sometimes feels unnesessary. However, there are fields where the camera falls short. No photograph can take the place of the fine line-drawing for scientific books and papers, and even for popular books. Nor can it construct the botanical charts for teaching aids that are studies in color, greatly enlarged, of plant and flower parts. In short, the camera is a highly efficient tool, but so far it does not replace the sensitive hand and the loving heart of the artist.

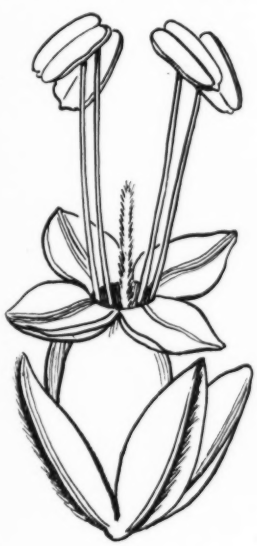
A world of undreamed beauty of detail opens up to the botanist and botanical artist with the hand-lens and microscope. Indeed, the almost incredible wonder and beauty of design in flower and plant parts can be known only by those who dissect them. Though we turn a flower, large or small, in every imaginable way as we examine it, observing it from above, from the sides, from the back, we still do not know one of the chief components of its beauty, the beauty of the contour; this is hidden until we have made a longitudinal section. Then the exquisite vase-like form is revealed, of such purity of line that it is a keen esthetic pleasure just to look at it. The convolvulus flower and the pear blossom are good examples. Furthermore, within both these lovely forms each individual part is also exquisitely designed. Take one of the tiny disc-flowers of the sunflower. These are crowded together in what we call the "brown center," because, as we look down on the stigmas collectively, they appear to be a brown pincushion; under the microscope each tiny flower of the brown center is a delicate little urn. This urnlike form is also seen in the female flower of the walnut tree and in many other flowers.

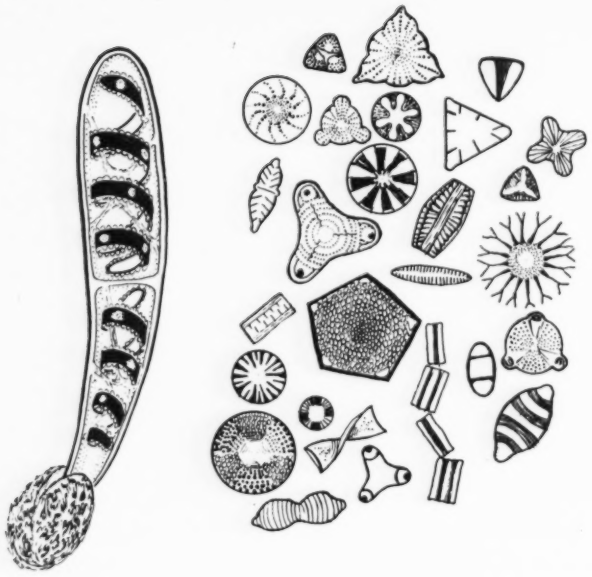


Flower parts.
Left. Disc-flower of sunflower.
Right. Flower of a walnut tree.

There is a Chinese proverb: "All the flowers of all the tomorrows are in the seeds of today." Turn this around to read, "All the seeds and fruits of all the tomorrows are in the flowers of today," and it is still literally true. Looking closely at the base of the style in the peach blossom, we see the ovary which will swell and develop into the succulent peach. On the dome in the center of a strawberry or blackberry flower, one can see many minute pistils, each of which gives rise to a "seed" (to botanists, a small one-seed fruit) with which we are familiar on the surface of the berry. In the pea flower the ovary at the base of the style becomes

Flowers of grasses and weed: Left. Floret of plantain. Center. Flower cluster of Kentucky blue grass. Right. Flower cluster of brome grass.





Algae: Left. *Spirogyra*. Right. Diatoms.

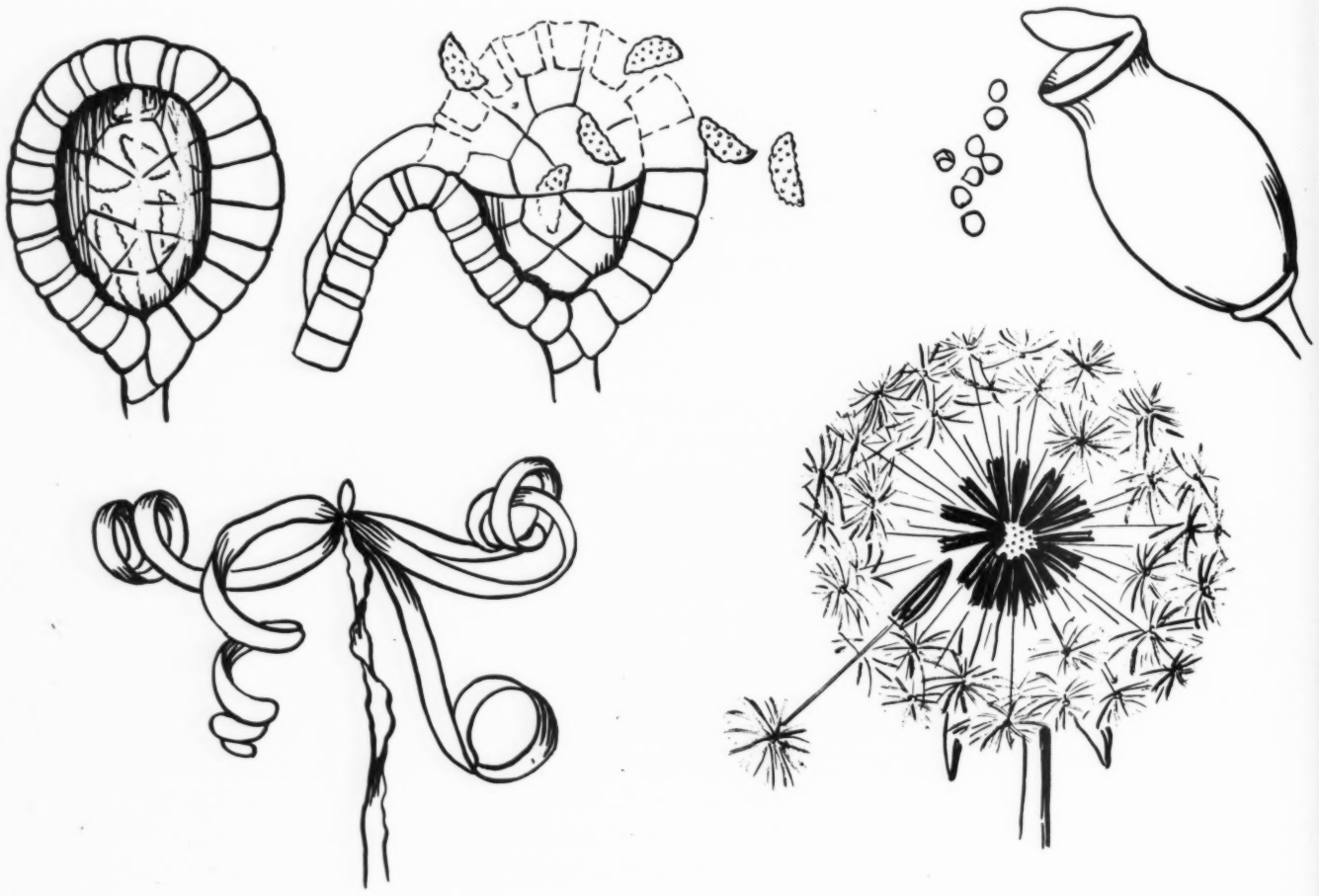
the pea pod, containing the ovules—the future delicious peas. The ovary of the tulip, which will become the fruit, shows when cross-sectioned a balanced triangular design appropriate for a piece of modern jewelry.

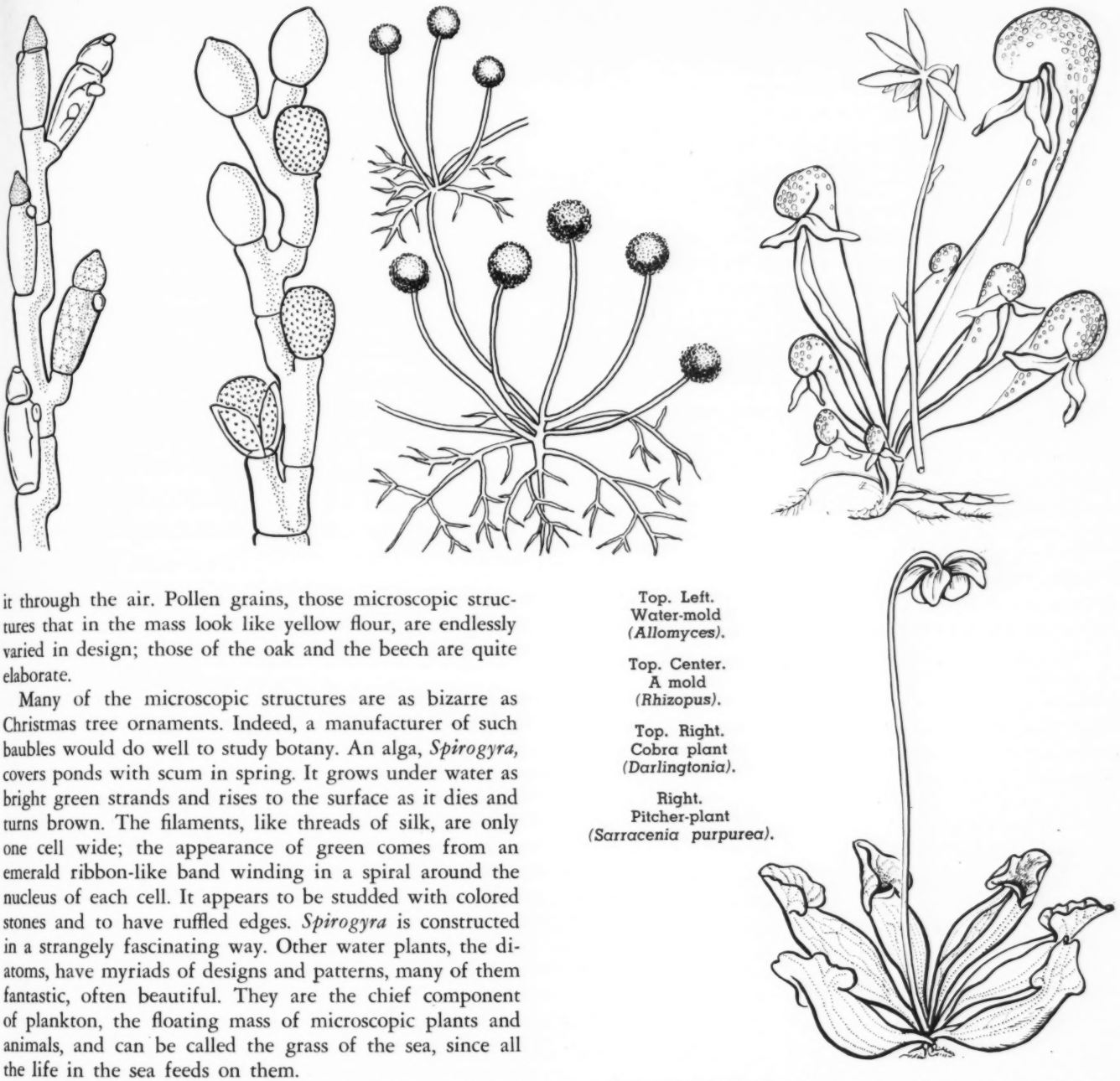
All these and hundreds of others are visible with a hand-lens. Not much greater magnification is required to see the minute flowers of the grasses, perfect in all their parts except that they lack petals and sepals. Grasses are wind-pollinated; they do not attract bees, and they have not developed the showy petals of complete flowers. But even so, the grass flowers are lovely in design. Those of rye and wheat have glistening stigmas like miniature crystal trees, with many branches that are barbed to catch the airborne pollen. As these are extended, their numerous branches catch the light and reflect the colors of the spectrum, like tiny prisms.

Even our old enemy the plantain weed has a flower cluster that is exceedingly lovely; it is made up of small florets, each of which has four tiny petals. These florets are arranged in a spiral, forming the flower head; opening in a succession of bloom from bottom to top, they make the center structure look somewhat like a ruffled pineapple.

As we go deeper with the microscope, marvels of design come to light in spores, pollen grains, and cells. The spore of *Lycopodium,* a little club-moss, is based on a triangle, with finely etched pattern on the tiny shell. In actual size approximately one hundred of these could be put on a pinhead. The pollen grain of the pine is a wonderfully efficient structure. It is equipped with two wind bags to carry

Seed and spore dispersal: Top. Left. Fern sporangium or spore case. Center. Sporangium discharging spores. Right. Spore capsule of hairy-cap moss. Bottom. Left. Seed capsule of *Impatiens*. Right. Dandelion seed head.





Top. Left. Water-mold *(Allomyces).*

Top. Center. A mold *(Rhizopus).*

Top. Right. Cobra plant *(Darlingtonia).*

Right. Pitcher-plant *(Sarracenia purpurea).*

it through the air. Pollen grains, those microscopic structures that in the mass look like yellow flour, are endlessly varied in design; those of the oak and the beech are quite elaborate.

Many of the microscopic structures are as bizarre as Christmas tree ornaments. Indeed, a manufacturer of such baubles would do well to study botany. An alga, *Spirogyra,* covers ponds with scum in spring. It grows under water as bright green strands and rises to the surface as it dies and turns brown. The filaments, like threads of silk, are only one cell wide; the appearance of green comes from an emerald ribbon-like band winding in a spiral around the nucleus of each cell. It appears to be studded with colored stones and to have ruffled edges. *Spirogyra* is constructed in a strangely fascinating way. Other water plants, the diatoms, have myriads of designs and patterns, many of them fantastic, often beautiful. They are the chief component of plankton, the floating mass of microscopic plants and animals, and can be called the grass of the sea, since all the life in the sea feeds on them.

Perhaps one of the strangest of this bizarre group is a mold named *Rhizopus,* a delicately beautiful structure when seen under the microscope, its grape-blue balls balanced on slender thread-like stems with many little rootlets. Even more bizarre is a water-mold, *Allomyces,* a fungus which has two distinct designs, that is, it goes through two entirely different structure-patterns in its life cycle. One of the structure-patterns appears to consist of two-parted, transparent balloons attached to an oddly shaped filament. These balloons contain the male and female gametes which are motile, that is, they have a little tail and can move about. These tiny tadpole-like creatures can be seen squeezing their way out of small apertures in the balloon-like structures. Afterwards they fuse in pairs, then grow "roots," and develop into entirely new orange pear-shaped structures growing on a filament. Merely as abstract shapes these might well repay an artist's study.

Among the most prevalent structural patterns is the spiral. This effective design is seen in algae, in pine cones, in the inflorescence of the plantain, in the pistils of the buttercup, and in the arrangement of leaves in the leafy shoot. Many of the spirals follow a mathematical pattern, an amazing indication of the minuteness with which our universe is ordered.

This Designed Universe

In this close examination of the plant we are constantly impressed by evidence that good design is the result both of sound construction and of definite function. There are many unique contrivances in the structure of a plant, some of which bring about the continuation of life, either in the plant or in its offspring, and each one in itself is an interesting pattern.

The spore case of a fern is a good example. The little

cinnamon-brown dots, or sori, on the back of a fern frond are made up of a cluster of many compact sporangia or spore cases. One of these, when examined, shows a lens-shaped case that contains numerous spores surrounded with a covering of cells. As the spores ripen, the enclosing cover breaks at a weakened spot; the case then springs open and bends backward, forcing the spores to fly out and scatter. When the spore case is splitting, it strongly resembles the casque, or helmet, of the medieval knight.

The seed dispersal mechanisms of *Hamamelis* (witch-hazel) and *Impatiens* (touch-me-not) are also based on an exploding action of great force, and are equally unique in design. In *Impatiens,* after the seeds have been discharged, the capsule winds itself up into many curious spirals like a released spring; these often suggest patterns of skillfully wrought iron.

Both the cross section of a white pine needle and the central portion of a fern stem look like exquisitely designed pieces of complicated machinery, and like machinery their functions are precise. It would be needlessly technical to discuss here the functions of the different bundles of fibers; it is enough to see how beautifully symmetrical they are.

The seed capsule of the hairy-cap moss is designed like a shaker; under the hairy cap we can see the shaker that scatters the spores from beneath its lid.

The dandelion is a marvel of functional design in all of its parts, and to me is a very pretty plant. I am sure if we had to lift it in the fall, or pay a high price for seeds or for young plants in the spring, it would be found in every cultivated garden and purposely placed there. As it is, few beside the botanists realize its functional beauty and perfection. Nature intended this plant to persist, and it has. The rosette of leaves and the large tap root conserve moisture, and the radiating arrangement of the flower head and the seed head is the best possible design for prolonging the life of the plant. We are never at a loss for dandelions.

Probably of all the examples of functional design the most dramatic are the devices whereby insectivorous or carnivorous plants trap insects for food. Since some grow in sphagnum moss bogs where nitrogen is low, they get their supply of nitrogen from the soft parts of the bodies of insects which they digest. One species of pitcher-plant has a curious flower of red or yellow on a long bare stem; but the parts of the plant active in procuring food are the leaves, which are like cornucopias with a pitcher-like lip. This pitcher holds a liquid containing a digestive substance, and the leaf is equipped with downward pointing hairs that permit the insect, attracted by the color or odor, to crawl down, but not up, over them. Unable to get back, after struggling to the point of exhaustion, the insect falls into the liquid and is drowned and then digested by the plant. Both the strange flowers and the pitcher-like leaves are fascinating in design.

Another genus, *Darlingtonia,* has been known as the cobra plant because the hood-like structure on the end of the leaf resembles the dread snake. Thin membrane-like little windows, which allow the light to penetrate the hood, lure the insect to his doom, because he confuses the false windows with an exit.

One especially pretty insectivorous plant is the sundew. It has numerous hairs growing from its leaf blade. The globular head of each hair secretes a sticky juice and shines like a dew drop in the sun, so attracting the insect which is entrapped as the hairs close around it like tenacles.

Even the process of cell division, a miraculous process that is going on in every living thing, makes handsome patterns as chromosomes and other tiny structures within the cell go through the various stages of forming a new nucleus and a new cell wall, so that two complete cells stand where formerly there was only one.

It has been said that the most beautiful symmetry in the world is the symmetry of the living system. And so perhaps more than any of us can now conceive, we are all part of a vast pattern, from the tiny chloroplasts in the cell to the largest living thing, the big tree. And the design found everywhere, whether in a pine needle, in a wood cell, in a crystal, in the milky way, or in the whole vast created cosmos, is perhaps proof that we belong to an ordered universe.

MEDICINE — ITS DEBT TO THE VEGETABLE KINGDOM

By JOHN C. KRANTZ, JR.

Dr. Krantz, who is Professor and Head of the Department of Pharmacology of the School of Medicine, University of Maryland, presented this paper before the Southern Shade Tree Conference, held in Baltimore, Maryland, in February, 1961.

DISEASE is the arch-enemy of man—it has harassed his activity all along the tortuous path of progress from a superstitious dweller in cliffs to an occupant of the modern skyscraper. Every human achievement has been conditioned by and limited to man's success in combating his ever-vigilant enemy, disease. Toward the end of the nineteenth century the French left thousands of tombstones in Nicaragua as a monument to their failure to build a canal and to the triumph of malaria and yellow fever. In the beginning of the twentieth century the United States built the Panama Canal, severing the spine of the continent as a miracle in engineering, but to no less degree triumphing miraculously over the devastating diseases of malaria and yellow fever.

Man has always been awed by disease. He has considered it divine punishment, the visitation of the devil, the capriciousness of nature, and more soberly the natural milestones on the journey of life. To survive he has learned that

disease must be checked and thwarted. Today, with every scientific tool available, he wages endless warfare against disease.

What is the news from the battle front? How is the campaign going? Let us examine the record. During the Roman Empire the average life expectancy at birth was twenty-one years. When William McKinley sat in the White House, the life expectancy had been increased to forty-five years. And now as John F. Kennedy assumes the task of the presidency, it has been increased to seventy-two years. For these enormous gains mankind and medicine owe a great debt of gratitude to the vegetable kingdom.

The story begins more than three centuries ago. The Countess of Chinchon was cured of malaria fever by the use of Peruvian bark *(Cinchona),* known to the South American Indians as "quina quina" bark. The bark was taken across the Atlantic Ocean to Spain. In Europe, however, it was opposed by many physicians who contended that because the drug was not mentioned in the works of Galen, its value was questionable. In 1820 the distinguished French pharmaceutical chemists, Pelletier and Caventou, succeeded in isolating from the bark the alkaloid quinine. The value of this active principle in the treatment of malaria was irrefutably established.

Malaria has played an important part in military campaigns of ancient and modern times. The vacillation of the Greeks before the walls of Troy is alleged to have been caused by malaria. The soldiers of Hannibal dropped like mists before the sun in the pestilential environs of Rome. Lee suffered from repeated attacks of recurrent malaria during the hard campaigns of the Civil War. He had contracted the disease in Baltimore, while he was supervising the building of Fort Carroll in the Patapsco River. Campaigns in southern Russia during World War I were hampered and modified by the omnipresent anopheles mosquito.

Shortly after the Versailles treaty the Germans attempted to achieve their independence of natural sources of antimalarial drugs and produced "Plasmoquin"; this scored its shining mark in the cure of malignant malaria, against which quinine is not very effective. In 1932 "Atabrine" was announced—it was the result of the synthesis and trial of twelve thousand new compounds. Had the authorities of the Third Reich kept the secret of "Atabrine," our problems in fighting World War II would have been greatly accentuated. Java produced ninety-five per cent of the world's supply of quinine. When this island fell into the hands of the Japanese shortly after Pearl Harbor, our ability to combat malaria might also have passed, had not American scientists been capable of producing "Atabrine." With it we were able to keep troops in the South Pacific malaria-infested jungles, wage a successful African campaign, and keep troops in Sicily despite the presence of the deadly anopheles. Without "Atabrine" history would have been different. And for the conquest of the ubiquitous disease, man can thank the vegetable kingdom.

Pain is another enemy of mankind. It is a tax levied on everyone for the privilege of life upon this planet. Some are taxed heavily, others lightly, but all are taxed. Man combed the earth to acquire agents that would permit him to achieve a surcease from pain. And again the vegetable kingdom responded. The opium poppy *(Papaver somniferum)* yielded morphine. This was the first alkaloid extracted from a plant. Syndenham declared, "Medicine would be a one-armed man without it." But morphine is like the finger of God, it can heal and it can smite. Addiction to its use has been one of the curses of mankind. Yet in the relief of pain, it has rendered invaluable service.

Let us now turn to the "heart of the matter," for the vegetable kingdom provided the purple foxglove *(Digitalis purpurea)* for the treatment of congestive heart failure. This is how it happened.

One of the most distinguished societies of England in the eighteenth century was the Lunar Society. Among its members were Erasmus Darwin, grandfather of the immortal Charles Darwin, James Watt, who discovered the power of steam, Joseph Priestly, who discovered oxygen and nitrous oxide, and William Withering, the "flower of English physicians." The principal of Brazenose College was seriously ill with dropsy. The standard treatments of the day had failed. The herb concoction of Mrs. Hutton of Shropshire was tried and produced dramatic results. This information reached Withering, who had the simplicity to wonder about it. He sought out Mrs. Hutton and for a few golden sovereigns secured the formula for the herb concoction of many ingredients. Carefully and experimentally he tried the activity of the various drugs on turkeys, ultimately arriving at the conclusion that it was the leaf of the purple foxglove that was responsible for the beneficial results. Those who are physicians in this audience can hear him as he said, "With this drug we can regulate the pulse at will." Little did he realize the importance of that timeless paper, published in 1785, "The Foxglove and an Account of Its Medicinal Properties." Withering, the busy clinician, Withering, the distinguished botanist, Withering, the connoisseur in mineralogy, would have been lost to posterity, and the same tomb which covers his body would have covered his fame also, if he had not had the simplicity to wonder about and the ability to question an old herb concoction. And because of the value of digitalis in congestive failure, the vegetable kingdom has made it possible for many Americans to go about doing useful work who would otherwise be on their beds of illness.

Mental illness and its treatment are major problems of society. For its solution man anxiously awaits advances in the medical and social sciences. To emphasize the vastness of this problem one needs only to state that approximately fifty per cent of the hospital beds in the United States are occupied by mentally ill patients, and that nearly two hundred thousand people annually are affected by mental illness. The cost of this affliction to the American taxpayer is approximately one and a quarter billion dollars, to say nothing of the loss of productive work, and the anguish

and emotional trauma that are entailed by the illness of the mind. Sixty per cent of these patients are released the first year, some to return later; five per cent are released after two years, but only one per cent is released thereafter. The remainder are kept under hospital care for an average period of twenty-six years. Within the past few years the vegetable kingdom has made a definitive contribution to thwart the insidious ravages of mental illness.

About a decade ago a chemist named Albert Hofmann, while he was working with some of the derivatives of the old obstetrical drug ergot *(Claviceps purpurea),* inadvertently ingested some of the dust from a derivative known as lysergic acid diethylamide or LSD_{25}. He experienced vertigo and blurring of his mental alacrity. He took a small quantity of LSD_{25} and experienced delirium, dizziness, and a display of fantastic images and rapidly changing colors. The syndrome in some respects resembles the disturbed mind of the schizophrenic patient.

It was soon discovered that a chemical substance found in the brain, called serotonin, related chemically to LSD_{25}, could terminate the schizophrenic-like symptoms produced by LSD_{25}. Related chemically to the normal brain constituent, serotonin, is the interesting Indian drug reserpine. This drug, derived from *Rauvolfia serpentina,* has been used for years in Indian medicine in the treatment of the mentally ill. It was soon discovered that reserpine used in the treatment of the psychomotor turbulence of schizophrenia achieved its action by displacing serotonin from its sites of deposit in the brain.

Reserpine was followed by chlorpromazine, which likewise acts definitely upon certain brain constituents, producing tranquil states in agitated patients. Chlorpromazine chemically is a phenothiazine derivative. The organic chemist has not been slow in producing many modifications of this drug. Among these anti-psychotic drugs are "Sparine," "Trilafon," "Pacatal," and a score of other agents which have broadened the spectrum of therapy in mental illness and have enabled the patient to receive benefit with a minimum of disagreeable side effects. Mental illness has been an enigma, and to the vegetable kingdom we owe our first definitive clue for unravelling its subtle perplexities.

Man has raised his eyes to the hills from this earthly vale of tears and exclaimed as did Jeremiah, "Is there no balm of Gilead—is there no physician there? why then is not the health of the daughter of my people recovered?" The vegetable kingdom has met the plea with quinine, digitalis, morphine, reserpine, and other drugs. We stand in awe of the vegetable kingdom with its complex chemical syntheses, as did Tennyson when he penned

> Flower in the crannied wall,
> I pluck you out of the crannies,
> I hold you here, root and all, in my hand,
> Little flower—but if I could understand
> What you are, root and all, and all in all,
> I should know what God and man is.

Just as the shade trees, which you nurture and cherish, protect man from the impartial heat of the noon-day sun, so the drugs derived from the vegetable kingdom shield him from the relentless ravages of disease.

ESSENTIAL CONSIDERATIONS FOR ROSE-OIL PRODUCTION

By ROBERT L. SWAINE

Mr. Swaine is with the Food and Flavor Section of Arthur D. Little, Inc., Cambridge, Massachusetts.

As an industrial perfume chemist, I receive each year many letters that briefly go something like this:

"Dear Sir:
"I have just finished reading an article in a certain popular magazine that says rose oil costs $500 per pound. I have in my garden several rose bushes. Can you tell me how I can get the oil from these roses and, secondly, where can I sell this oil?"

The above letter obviously is ficticious, but if one were to substitute sweet pea or lily-of-the-valley or any of about thirty other flowers, he would have some idea of the interest people have in capitalizing on flowers for more than appearance's sake.

It is true that the concentrated scents made from flowers are costly. However, before one considers capitalizing on the odor characteristics of flowers, there are three points that must be considered. The first is the type and quantity of flowers; the second is the technical know-how; and the third is the labor cost. Going into some detail on each of these, I would give the first answer to the writer of the above letter by pointing out that the yield of floral concentrates from most flowers is exceedingly small. Technically speaking, a good yield is around one-tenth of one per cent; thus to obtain a pound of rose oil one would need a thousand pounds of rose petals. Obviously, the horticulturist who may have one dozen or even ten dozen rose bushes cannot produce the quantity of roses necessary for a commercial concentrate operation.

The next disappointment that I am forced to tell my correspondent is that even if he had a sufficient quantity of roses, it is doubtful that he has the correct variety. As roses have been bred to capitalize on their appearance, their delightful aroma has decreased. Therefore, most roses today are entirely unsuited for perfume work. The original Bulgarian rose, *Rosa damascena,* as well as *Rosa centifolia,* the commercial rose of France, are the two main kinds of roses that are grown for their aroma. In appearance, these two roses would never win any honors in a rose show. Now that I have thoroughly disappointed my letter-writer by saying that he does not have enough roses and that, even if he did, they are not the correct variety, I must further disappoint him by pointing out the commercial procedures necessary to obtain the rose fragrance from the rose and to put it in some commercial form useful to the perfumer.

The origin of rose oil, or otto of rose, as it is sometimes called, is not entirely clear. Some historians say that it was first produced in China. The story goes that a scum of rose oil was found on the pool of one of the emperors of China after he had had it filled with rose water. Others say the first production of rose oil occurred in Bulgaria where it was distilled during the early part of the Middle Ages.

Actually, Bulgaria is the country that has, up until the last few years, produced most of the rose oil of commerce. The phrase "otto of rose" is almost synonymous with Bulgarian rose oil.

Today, considerable quantities of oil of rose are also produced in France and Morocco, and smaller quantities in several other countries. By understanding how oil from the rose is obtained commercially, the amateur can easily see the inadvisability of attempting its manufacture.

There are three methods of obtaining oil from the rose; distillation, one of the oldest, is still used today; enfleurage, although not used as much now, is historically of great importance; and solvent extraction, the one most often used.

The traditional distillation in Bulgaria consisted of placing freshly picked rose petals in a large kettle with water. This rose-petal–water mixture was boiled by direct heat, and the mixture of rose-oil vapor and steam was carried through a condenser where it was condensed into rose-oil droplets in water. This mixture was set aside, and the process was repeated with a fresh batch of roses. After several of these distillations had been completed, the mixture of rose-oil droplets and water was again distilled in the same manner; and this time the rose oil was collected as it floated to the surface of the collecting vessel. This rose oil, separated from its surrounding water, was known as otto of rose. Improvements have been made so that now instead of directly heating the water–rose-petal mixture, steam is introduced and the steam carries over the oil droplets to a collecting vessel, from which the oil is separated. It is important in this, as well as in the other methods, that the roses used be freshly picked and that they not be allowed to dry out or lose their delicate aroma.

The second method is that of enfleurage, which can probably best be described as the mechanism by which butter picks up fish odor when the two are placed in the same refrigerator. Enfleurage is a French process. Freshly picked flower petals are placed in contact with a bland fat. The petals are left in contact with the fat for about twenty-four hours. At the end of this time, the old petals are replaced by fresh ones. This may be repeated many times, and it is not uncommon to use up to thirty-six different changes of rose petals. The rose oil is separated from the fat by extraction with alcohol. The alcohol–rose-oil mixture is then further purified until a product called an absolute containing only rose oil is obtained. This resulting product, manufactured without heat, is of the highest quality of odor and somewhat different in type from the rose otto produced by the application of heat either directly or in the form of steam.

The third method and one that is becoming most popular is that of solvent extraction. In this method the rose petals are mixed directly in a container to which a suitable solvent, such as petroleum ether, benzene, or hexane, is added. This material selectively dissolves the rose oil together with certain waxes from the rose petals. Then the solvent is carefully removed. Here again little, if any, heat is involved so that the resulting concentrate is of excellent odor quality. This concentrate is further purified so that the waxes are removed, and a pure absolute of rose oil is left.

To efficiently operate the distillation, the enfleurage, or the solvent extraction process, hundreds of tons of rose petals must be available. The technical know-how is vitally important, otherwise the resultant product will be of inferior quality. It would be rather foolhardy to use these methods, and hope to obtain sufficient quantities of a quality rose oil that could be offered to the perfume trade, without sufficient technical background and a sufficiently large quantity of roses.

A third point must also be considered, that is, the available labor supply. There exists in Europe, Africa, and Asia a labor force whose hours are long and whose pay is relatively small. Perfume oil producers have relied upon this labor market particularly for picking flowers from the fields. It is not uncommon in these countries to see small children and elderly people working from before sun-up, when the roses are at their prime, until late in the afternoon. Here in the United States, such labor supply is not available. Hence, the cost of using skilled labor to pick roses becomes prohibitive.

Summarizing a perfume chemist's thoughts to those who have enjoyed the appearance of a rose and have considered the advisability of extracting the rose aroma for profit, I must caution that: 1) the type and quantity of roses you have are probably not correct; 2) the technical know-how certainly must be mastered; and 3) there is a distinct shortage of suitable labor, should you be able to conquer the first obstacles.

RESEARCH ON BLACK SPOT OF ROSES

By E. W. Lyle

Dr. Lyle is Plant Pathologist of the Texas Rose Research Foundation, Inc., Tyler, Texas.

Black spot is listed frequently as the most damaging disease of roses. Its primary harm is defoliation with yellowing and loss of leaves during the growing season, and this results in stunting of the bushes, fewer blooms of smaller size, and less color and fragrance. The bushes become subject to dieback of the canes and to winter-killing, with both conditions being associated with decrease in vitality proportionate to the amount of and the length of the period of defoliation. The cause of black spot is a fungus *(Diplocarpon rosae)* that occurs only on the rose and no other plant. The disease has been known for more than a century and develops on wild as well as cultivated forms of roses in all except the most arid regions in which roses may be found.

APPEARANCE

Black spot is recognized mainly by the unsightly spots or blotches on the rose foliage; however, the disease can infect stems, canes, and other new growth. The importance of cane lesions of black spot was described as early as 1918 by N. L. Alcock in England, and from such spots it is quite likely that most of the new infections originate early in the season. The black color of the infections is from decomposed rose tissue rather than from the fungus, since the fungus threads (mycelia) and spores are nearly colorless. The spots generally have fringed or irregular borders

and increase in size as the fungus spreads through the host tissue. Development is slow in cool weather and faster in warm; subsequent defoliation likewise is influenced by the temperature. Infections do not become apparent until from five days to three weeks or longer after spore germination and initial entry into a rose leaf, depending again on temperature, humidity, and conditions of plant growth.

SPREAD

Black spot is distributed by the fungus spores, which are loosened by rain or water from the spots in which they form. The spores are carried usually by wind-blown rain or spattering to other leaves or places to begin new infections. Moist conditions favor the germination of the spores; investigations and study have revealed that infection occurs only after the spores have been in water or an atmosphere of high humidity for a period of six hours or more. Further examination has disclosed that the first spread in the spring is probably from spots carried over winter in the canes or from attached leaves that remain on the branches rather than from fallen leaves on the ground. Certainly there is no proof that the fungus overwinters in the soil itself. This is substantiated by data published in *Phytopathology* in 1958 by the United States Department of Agriculture at Beltsville, Maryland, in which close pruning of the canes during the winter nearly eliminated early black spot infection.

L. M. Massey, Cynthia Westcott, Alice Aronescu, E. W. Lyle, and others have reported many of the experiments and studies that deal with the cause and development of black spot. Significant is the fact that both the upper and lower sides of the leaves may be infected and that the spores tend to be held together where formed until freed by water. This could account for better control by the use of spray rather than dust fungicides.

CONTROL

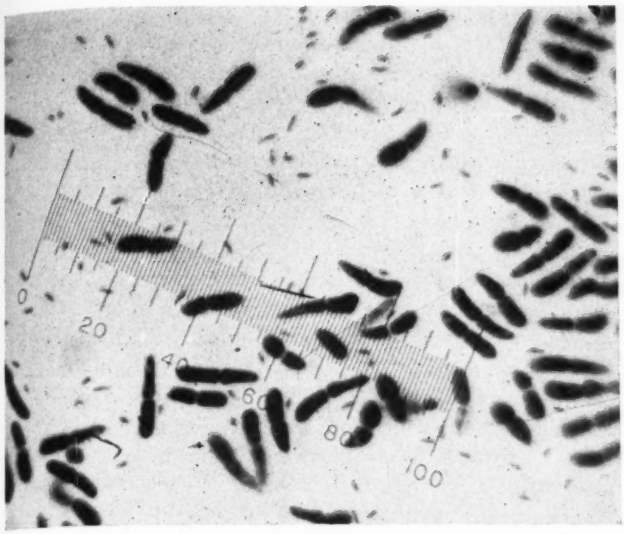
Certain of the new spray fungicides have given remarkable action against black spot so that nearly complete control has been effected. This has been accomplished even when the treatments were not started until the disease was widespread. The experiments in 1957 reported by the Texas Rose Research Foundations, Inc., showed the best sprays reduced black spot to five per cent or less by September 24, when the dust fungicide considered best had thirty per cent and the untreated checks had sixty per cent infection. Twelve applications of the fungicides were made from June 12 through September 25. Seven thousand bushes of 'Floradora' were in the test.

As reported in the *American Nurseryman,* April 15, 1958, tests with spraying to control black spot have proved the importance of an adequate volume for each application. A rate of two hundred and forty gallons per acre for each application was nearly twice as good as one hundred and twenty gallons.

The 1959 trials, as reported in the *American Nurseryman,* November 15, 1960, indicated that two hundred and fifty gallons per acre of half the normal concentration of maneb were better than one hundred and fifty gallons per acre of the normal concentration of one and a half pounds per one hundred gallons.

The best results so far in Texas have come from five spray fungicides: "Dithane M-22," "Phaltan," "Manzate," "Cyprex," and captan. Both "Dithan M-22" and "Manzate" are maneb compounds. All have given good results when properly used, and each has an advantage over the rest. Less

Black spot on rose leaves. The size of the spots is indicative of how long the infection has existed; spots grow about one quarter of an inch in diameter for each five or six weeks.



Spores or conidia of the fungus that causes black spot, dispersed in water and stained to be photographed. Two thousand spores end to end would be about an inch in length.

beneficial have been "Fermate," "Zerlate," "Glyodine," "Dyrene," and "Thylate," to name some of the other sprays that are available commercially. The addition of a spreader-sticker such as "Triton B-1956" or "Plyac" has appeared to improve the action of the maneb sprays but not the latest formulation of "Phaltan."

Caution should be given about using concentrations that are too strong or the repeated use of certain chemicals that gradually become damaging through accumulation. "Cyprex" was found harmful after the second treatment at the rate of two pounds per one hundred gallons; yet it was quite safe and effective at a quarter of a pound per one hundred gallons, and equally so at a one-third-pound rate through eight applications. Captan spray was found safe through twelve applications at rates up to six pounds per one hundred gallons; it did give good control of black spot at that concentration, but it left an unsightly deposit of chemical on the foliage.

Regular weekly spraying has given good control of black spot in both field and garden treatment. For several seasons here the system has been to begin with weekly applications and then to reduce the frequency when the disease is absent or the weather dry. Usually the tests have been concluded with treatments every other week; in this manner the residual effect of the best fungicides was proved.

Nearly complete control of black spot can be obtained with bushes in close proximity to those with the disease. The distance of fifty-two inches from one row to the next can be sufficient to effect control in one plot while permitting it to occur in another.

While the volume of spray each time has been mentioned previously as important in the control of black spot, the pressure in spraying has less value except to speed the treatment. Sprayers may vary in pressure as much as from two hundred pounds to six hundred pounds and yet have comparable results, provided the same volume of spray material is applied. In the field trials cited, tractor equipment was employed in which the nozzles were set uniformly in height and direction, and the pressure was the same for all the plot treatments in each experiment. Practice has shown that excellent control may be obtained if the spray is directed upward from all the nozzles; thus, if sufficient coverage of the lower side of the foliage is obtained, enough spray gets to the upper side to accomplish black-spot control there also.

BENEFITS FROM CONTROL OF BLACK SPOT

Leaf counts and determination of the percentage of infection can show the degree of control of black spot. However, this represents the appearance for one particular date. Of greater value is the weight of the bush at the end of the season, because it reflects the accumulative effect of the series of applications and may show a growth response over a full season. At the same time it is not the size of the bush that is important as much as the factors of quality that would be included with an increase in size because of disease control. In one test the sprayed bushes averaged forty-two per cent more weight because of black-spot control than the unsprayed checks. Measurements of starch content in the rose canes are now used to indicate whether or not the bushes have been kept healthy and are of good maturity for harvesting and storage.

The satisfactory maturity of canes that has been obtained through the use of the new fungicides permits them to be kept in storage as budwood for as long as two years, when they are still of good vitality and condition for propagation. Hard canes and deep purple or green coloring of the bark are indications of disease control and of bushes that will survive transplanting and periods of storage. On the other hand, bushes that are devitalized by black spot or by some other disease or insect trouble usually exhibit light green bark and often have dieback in the branches.

Mention has been made in other publications that control of black spot one season may delay the incidence the next year. This benefit is in addition to those which are usually cited as to the greater number of blooms and the greater length of stems. The control of disease leads also to larger flowers with more color and fragrance. Over twenty years ago, in the annual report of the Texas Agricultural Experiment Station, the statement was made that defoliation seemed the most important factor to cause fad-

The rose 'Floradora' in a field test. Right. Control of black spot with fifteen applications of a maneb spray between June 12 and October 23, 1957. Left. No fungicide after June 1 showing defoliation and smaller-sized bushes resulting from black spot.

ing in rose blooms. Such observations must have been made many generations ago, but it has remained for the past few years of research and the development of fungicides to prevent black spot to the degree that is now possible. Fields and gardens can have roses nearly free from black spot year after year, without depending on weather to give a natural control one year in a decade as was formerly seen in this location as well as in many other places in the United States, where black-spot disease is a factor in rose-growing.

RUTGERS' RESEARCH ON EARTH'S MOST NUMEROUS CREATURES — THE NEMATODES

NEMATODES ARE WORMS, primitive even among primitive creatures, and are among the most numerous on earth. They may well prove to be one of man's worst economic enemies. Conservative estimates put the annual damage from nematodes at seven hundred and fifty million dollars, and a billion may be closer to a fair guess. Scientists at Rutgers University, in New Brunswick, New Jersey, estimated in 1959 that the nematode damage to agricultural crops in New Jersey alone was in excess of fifteen million dollars annually.

Nematodes are omnipresent on the face of the globe and beneath its seas. Solid rock will not support a nematode; but if a single lichen grows in a crack in a rock wall, there will likely be nematodes within the growth or in the meager grains of soil that support it.

Nematodes have been thawed from the Antarctic ice after years in nature's deep freeze. They have been found in Sahara's sands, at the bottom of extremely deep alpine lakes, and universally in the soil. A teaspoonful of typical New Jersey soil may harbor more than one thousand of these ubiquitous worms.

Since nematodes are aquatic animals, the sea bottoms of the world hold them in uncounted numbers. Scientists believe that seventy-five per cent of all the nematodes are marine forms; but so new is the science of nematology that there are only a few competent marine nematologists today, and their systematic study of the sea-bottom population has hardly begun.

Some scholars hold that Biblical reference to the "plague of fiery serpents" had its origin in a nematode which burrows deeply into the muscles of the leg. Medical men today know nematodes as the pinworm, the hookworm, and the *Trichinella* that causes the dread disease trichinosis. No fewer than forty-seven species are parasites of man.

There is reason to believe that ninety per cent of all humans harbor, at one time or another, some kind of nematodes (including the harmless, invisible ones that live happily in the filter beds of water-treatment plants and often come through the pipes into our homes).

Veterinarians have even more concern, since many more nematodes are parasitic on animals than on humans. Those which attack animals can typically grow to a foot or more in length (not to mention the specimen measuring almost thirty feet that was once recovered from the placenta of the blue whale).

The role of soil nematodes in plant damage was first reported in 1876 through the study of the plant disease known as root-knot; it was thereafter often dubbed the nematode disease. However, the significance of the teeming population of nematodes in the soil was not realized for many years. Root-knot disease is now known to affect more than two thousand different plant hosts, and no fewer than sixteen species of nematodes can contribute to the damage.

Scarcely fifteen years ago, scientists of the United States Department of Agriculture were experimenting with the fumigation of the soil to check populations of nematodes that live within the roots of plants. (These are the endoparasites.) In the course of their work, they noted that sharp and unexpected decreases in plant growth resulted in fumigated areas where the known parasites were not present. The reason was soon found; other varieties of nematodes in the soil had been attacking the plant roots from the outside. (These are the ectoparasites.) This dis-

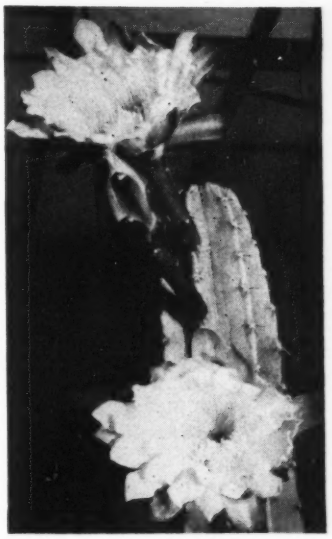
(Continued on page 177)

Dr. William R. Jenkins examines pots of young yews in a greenhouse at Rutgers University. These yews will be tested for their susceptibility to various nematodes. Research will also be undertaken to determine the effectiveness of different nematocides.

AN ENGLISHMAN WRITES OF THE GROWING INTEREST IN CACTUS AND SUCCULENT PLANTS IN EUROPE

By Sir Oliver Leese

Sir Oliver became interested in cacti and succulents when he commanded thirty corps in the North African campaign in World War II under Field Marshall Montgomery. The collection he started as a hobby has grown into a profitable nursery—Worfield Gardens, Bridgnorth, Shropshire—in which Sir Oliver and Lady Leese are partners. They visited The New York Botanical Garden in February, 1960.



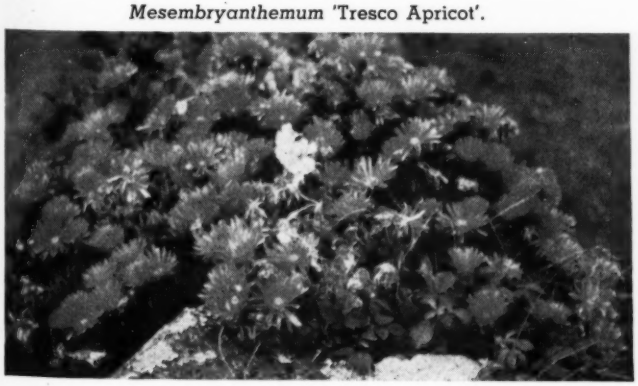
Cereus peruvianus

WHAT MAKES THE WEEDS of one country become precious and valued plants in another part of the world? In America you have cacti, prickly, ugly, fierce, looked upon by many as common and uninteresting, sometimes even as a menace, and yet a few thousand miles away these very plants are treasured possessions of hundreds of collectors, who rear and water them with loving care. The cacti are not the only plants of this category, for it includes most of those which, for want of a better name, have become known as succulents. They are the camels of the plant world, and they exist in every country where water only comes at infrequent intervals—sometimes up the slopes of rocky mountains, sometimes along the edges of a desert.

There are over nine thousand different kinds of succulent plants in the world. These include some sixteen hundred natural species of cacti and many epiphyllum hybrids. The other succulents are scattered through many different plant families. The largest group comprises more than two thousand species of *Mesembryanthemum* in South Africa, embracing the shrubby ones, and the tiny lithops and other mimicry living-stone plants.

They are fantastic plants and especially so for someone who comes from a cold, damp climate such as we have in England. Before the second World War the average Englishman did not travel far afield from Europe; and the excitement and thrill, such as my wife and I have recently had in America, Mexico, and Africa, in seeing something of this succulent world in the wild, was confined to that now obsolete species "The mad dog Englishmen," who through many decades challenged the rays of the midday sun in well nigh every part of the globe. But today all this is changed; with the restrictions off the currency regulations and with the increased ease and efficiency of air travel, the world is open to the British tourist. In Europe, especially, travel charges have now come within the means of many British families who before the war could not afford the luxury of going abroad. Many of the countries now open to British tourists can be reached in a few hours from London and include seaside resorts on the Mediterranean and Adriatic coasts, where the warm climates are well suited to the growth of succulent plants.

Mesembryanthemum 'Tresco Apricot'.



The Mediterranean basin is the region in Europe where cacti are grown out-of-doors most successfully. Here one finds the prickly pears (the opuntias) with their flat spiny pads, the agaves with their long pointed leaves—either bluish green or variegated with streaks of gold and yellow—and an attractive array of tall, deep green euphorbias. The prickly pears and the agaves have flourished in these parts for so long that the local inhabitants consider them indigenous. But this is very far from true, as they originally came from America, possibly in the ballast of one of Columbus' sailing ships. They are to be seen everywhere along the Mediterranean coasts of France, Spain, and Italy, for they grow well in the balmy sunshine and especially so in the anti-frost pockets that are to be found at intervals. In these coastal regions there are occasionally very cold winters, as occurred in 1958 when the opuntias were laid low by a long continuous frost. The old plants were killed; nothing was left standing except gaunt skeletons. However, when we went to Spain in the autumn, we noticed the little pads which had dropped to the ground; and so great was the urge for life that large numbers of new green plants had rooted and were starting to grow around the skeletons.

Opuntias are sometimes used for hedges, especially in Spain, where they are to be found on the estates where bulls are bred for the bull fights. They are a tough proposition to encounter, equally effective as and much more picturesque than barbed wire. Agaves, too, can often be seen, especially from the train, as they are used on embankments to stop erosion. In many places one will find the shrubby mesembryanthemums—usually purple, gold, or scarlet—growing along the sea coast just as they do in California where they have been introduced.

There is a brisk trade throughout the year in the coastal town for small cactus and succulent plants in pots—sometimes arranged like dolls' gardens with miniature colonnades

Trichocereus in bloom in a show exhibit.

or pergolas. These are well set in the gay little tourists' shops and in the flower markets, where the somber colors of the cactus plants are a foil to the vivid colors of the flowers that grow in the nurseries along the coastal strip.

A few succulent plants are also to be found in the nurseries in the south of France and in Italy, usually situated in anti-frost pockets, where a great deal of the work can take place out-of-doors. The gardens in these nurseries are often very attractive with a fine array of handsome plants, which are usually used for seed, but sometimes are sent to the cities of Europe for display purposes in the big horticultural shows. On two occasions since the war some of the finest Italian show plants, including magnificent specimens of *Cephalocereus, Euphorbia,* and *Echinocactus grusonii* have been sent to the Chelsea Flower Show in London. There they have attracted the same attention and admiration that they do in the vast continental Fleuralies in Paris and in Ghent.

Of all the succulent gardens in the south of France, that of the Jardin Exotique at Monte Carlo still ranks foremost. The plants occupy several acres along the cliffside, looking down on the azure sea and the lovely white outline of Monte Carlo. There are some beautiful tall plants; and in particular I remember the archways and tunnels formed by the giant specimens of *Cereus* under which a visitor winds his way from bridge to bridge as he saunters through the gardens.

There are also several cactus nurseries in other parts of France, where the plants are grown in heated greenhouses as they are in England and Germany. Some of these supply the Quais and the flower markets in Paris.

The Quai de la Megisserie, on the right bank of the Seine, is the hub of the horticultural world in Paris, including the house of Vilmorin. Along the river's edge are the little stalls that sell pictures, prints, and books and opposite are the caged birds, the fish, and the cacti. On the left bank of the river are the open flower stalls—a riot of glorious colors—with a few well-filled and covered stands that sell succulents and green plants.

In Spain, too, there are a few cacti, and an interesting outdoor garden at the Pinya de Rosa, near Blanes on the Costa Brava. Here Señor de Ribera, a successful industrialist, who is also a keen botanist, has created a garden to study various types of succulent plants. He works in very close collaboration with other European experts on succulent plants and has done a great deal to encourage research especially in *Opuntia, Agave, Aloë,* and *Mesembryanthemum* in which he specializes.

But it is not only in countries with seaboards on the Mediterranean where an Englishman finds cacti in Europe. There is an extremely interesting collection in one of the city corporation's greenhouses in Zürich, Switzerland, with as good a selection of small pincushion and barrel cacti as one will find anywhere. Germany, Holland, and Belgium, too, are countries where nurserymen grow succulent plants. Germany has given us many expert horticulturists and botanists, such as Curt Backeberg, Werderman, and Hermann Jacobsen, who have contributed greatly to the scientific work on this subject; and probably the best-known cactus seed firm in the world is Winter's establishment near Frankfurt. In Holland and Belgium several firms grow succulent plants, mostly for the market and for export. The soil along the canals forms excellent compost, and the plants grow well. A lot of grafting is done in Holland in order to provide large plants in as short a time as possible for the pot-plant trade; and one sees a cactus or succulent plant in most of the large and airy windows that one passes.

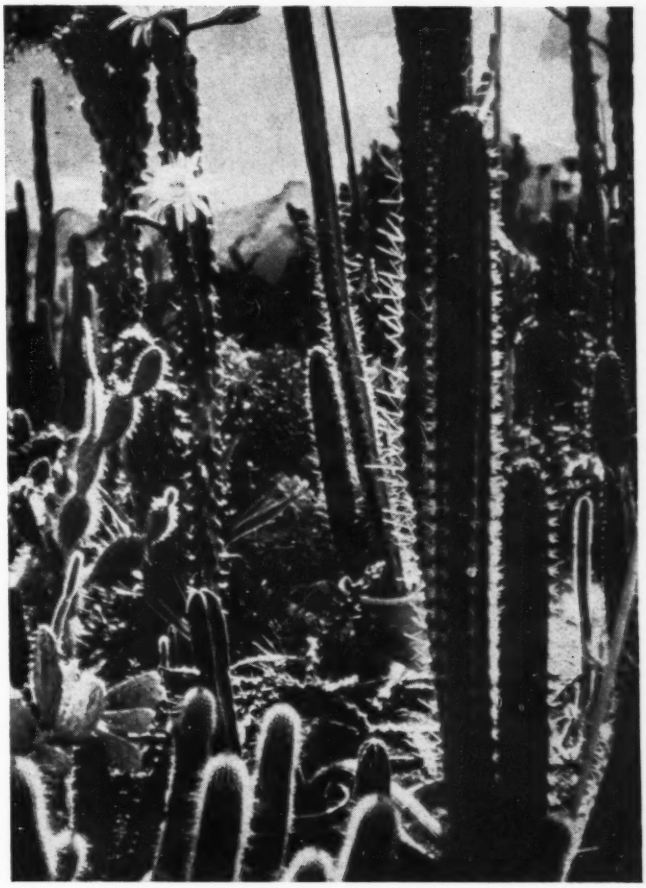
Sometimes the small pot plants for market are packed in wooden trays—with the pots plunged in the black compost—so that the soft blues and grays of the succulents contrast with the gay red and yellow flowers on small rebutias and notocacti. These boxes are piled on the open barges that sail down to the markets on the canals and are tended by Dutch boys wearing black corduroy trousers and narrow peaked caps. The markets, too, are fascinating. The barges go into the auction room, and the plants are sold in their boxes to the buyers. The buyers, sitting on raised seats, press the electric buttons in front of them and thus register their bids by means of the lights that appear on a board behind the barges. It is a most picturesque sight and well worth a visit.

In England the great horticultural event of the year is the Chelsea Flower Show, organized by the Royal Horticultural Society. During four days in May everyone who is a gardener or a plantsman likes to visit the show to see new plants or to enjoy again his old favorites. The exhibits cover a wide and varied range of plants of high quality. It is the shop window of a great gardening nation. For

An exhibit of cacti and succulents at the Shrewsbury Show.

the succulent lover, like every other earnest connoisseur of his own subject, there are stands—small and large—of cacti and succulents. Sometimes there are visiting enthusiasts, such as the Italian growers from Bordighera and San Remo with their huge golden barrels and white-haired cephalocerei, grown well and vigorously in the Riviera sun; or the German growers with arrangements of small cacti in squares and lines, much as they might have formed up their troops at Minden and Waterloo. Sometimes Africa displays a selection of succulents, including some of the weird, yet lovely stapelias from its arid regions. Several faithful British cactus nurseries always set up stalwart stands. Here the cerei, which very often flower at this moment, are quite as tall as any that come from the continent. A mass of smaller plants are usually in flower, from the tiny scarlet and yellow rebutias and the pink and mauve mammillarias to the many epiphyllums whose deep purple and red, salmon and pink are as vivid as any flower in the show. Among the other succulents, *Euphorbia splendens* should be showing its scarlet flowers, and the little grey-leaved *Kalanchoë pumila* from Kenya its graceful pink ones.

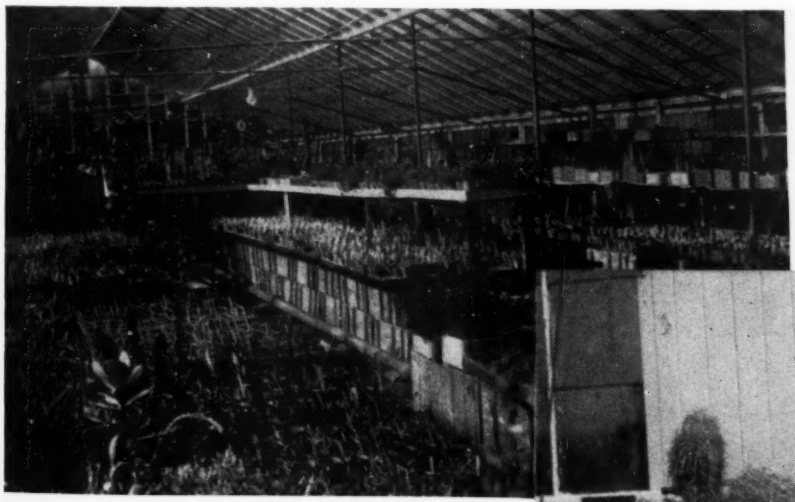
This is also a lovely time of the year in a succulent nursery in England. The echeverias have been in flower for nearly two months—with *Echeveria* 'Worfield Wonder' a riot of gold and scarlet flowers on its low, even slender stems which never sprawl or grow lanky and spindly. There are flowers on many of the big show plants—huge white scented ones on *Trichocereus spachianus* and white ones with a pink fringe on *Cereus peruvianus,* some of which at Worfield Gardens are over twelve feet high. There is a *Selenicereus grandiflorus* which is creeping all over the house, along the pillars and the girders, and is a sea of round white flowers. A fine big plant of *Trichocereus strigosus,* with an array of great, strong, golden limbs, bears lovely white blooms. These all look very effective in the big show house against a painted background of Saguaro-



Another show collection of cacti and succulents.

land in Arizona, with the selling benches in front filled with small plants, many of which are also in flower.

In England several cactus nurseries can put on displays of large plants, and sometimes members of one of the branches of the National Cactus Society get together to arrange a most impressive showing of fine plants. Worfield Gardens sometimes puts up large exhibits at the Chelsea, Shrewsbury, and Southport Shows, which are considered three of the largest and most important; and one year we laid out an exhibit, the design of



The sales house at Worfield Gardens.

Potting up plants from Mexico at Worfield Gardens.

which was based on Mrs. Whitney's lovely succulent garden at Rancho Santa Fe in California.

During the summer Worfield Gardens are open on several Sundays, and on one weekend over three thousand cactus enthusiasts visit us from all over England. We set up dioramas with painted backgrounds, in which we show the smaller plants growing in their native surroundings, and we plant many of our show plants in a long raised bed, so that our guests may have tea on the lawn amongst the cacti. At intervals we give short performances of the colored slides that we have taken in Mexico, Arizona, and Africa. Horticultural and cactus experts are present, ready to give advice and assistance, and it has become a great assembly of cactus enthusiasts who swap stories and pass on their knowledge to beginners and to children, who are often some of the keenest collectors.

Sometimes there is a large succulent garden at the big exhibitions at Olympia and Earls Court; and in this way it is possible for collectors in many parts of England to see fine displays of succulent plants. These are, of course, all indoors, except for those gardens that are temporarily planted out in the open in the summer, but there is one place in the British Isles that has a large display of succulent plants out-of-doors all the year round. This is at Tresco Abbey in the Scilly Isles. The garden here consists of several acres and contains mostly succulents. We were there in the spring when the whole place was a blaze of color from scarlet, purple, pink, and golden mesembryanthemums, with an occasional aloë bearing aloft its tall spike of gold and red flowers. The cottage gardens, too, were very gay with mesembryanthemums growing on the stone walls all over the island.

Maybe some of my readers are wondering why all these people in Europe like these weird cactus plants, which many look upon as commonplace, dull, and even ugly. The answer, I suggest, lies partly in their fantastic and intriguing shapes, partly in their wonderful flowers which suddenly emerge from their curious bodies, and partly in the fact that they will grow well in private houses and greenhouses under conditions that other plants might never survive. They form, too, an enthralling hobby for people of all ages, from young children to those who have retired.

Some of these collectors have a great urge to travel, in order to see these plants growing in their natural habitats in the Americas and in Africa, and many of them will, I hope, go to the United States. When they do arrive in your country, I know that they will never be disappointed, now that so many of the most spectacular cactus lands are protected by your far-flung system of National Parks and National Monuments.

INTERNATIONAL FRIENDSHIP GROVE AT THE UNIVERSITY OF WASHINGTON

By JOSEPH A. WITT

Mr. Witt is Assistant Director of the University of Washington Arboretum, Seattle, Washington.

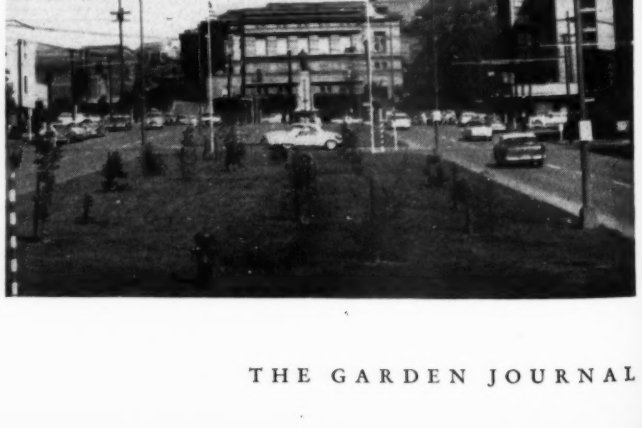
FRIENDSHIP groves are certainly not new, but in planting and dedication the International Friendship Grove on the University of Washington campus is perhaps unique. It was planned and planted as part of the Fifth World Forestry Congress held in Seattle last summer, a congress attended by foresters from some sixty-five nations, as a living memorial to the fact that nations can meet and discuss common problems in friendship.

It is difficult to say who first thought of planting such a grove, but the idea apparently arose in several minds simultaneously, and a committee of Forest Service, University, State, and commercial forestry representatives was appointed to work out details with Dr. Carl Ostrom, U.S.F.S., as chairman. We at the University of Washington Arboretum were privileged to be included and were assigned the task of helping to gather the trees, to hold them until the planting ceremonies, and to oversee actual planting.

The site chosen for the grove was on Campus Parkway, one of the western approaches to the University, an area of about three-fourths of an acre in the narrow dividing strip between the roadways. The south side is protected by large dormitories, the north by apartments, but at times a brisk wind blows directly down the street. Essentially flat at the eastern end, it becomes a steep north-facing bank at the west end—in all, a most difficult terrain to landscape with trees. The plans drawn by Lawrence Halprin and Associates, of San Francisco, envision the planting as a series of small connected groups composed of several large species interplanted with smaller ones. As the University expands, this section will become part of the campus and should form a beautiful and inspiring entrance.

We attempted to choose a tree typical of each country attending the Congress, within the limits of available trees and the climatic restrictions of Seattle. Fortunately, the Arboretum had a large stock of young trees in its nursery, many of them raised from seed obtained from the country they were to represent; and many others—especially northwestern natives—were offered by the Forest Service, Washington State Division of Natural Resources, Oregon State College, and the Greeley Forest Nursery. There was no hope of using native species of the tropical nations, since even Seattle's relatively mild climate cannot be expected to support anything more tender than *Azara microphylla* or *Nothofagus fusca.* For these countries we used trees native to the Pacific states, with a twofold purpose in mind: first, to insure that the species would thrive; and second, to have a collection of native trees closely assembled to-

The east section, looking toward the campus, of the International Friendship Grove at the University of Washington. In the right center *Pseudotsuga menziesii,* representing the United States; on the left, *Acer pseudoplatanus* representing France.



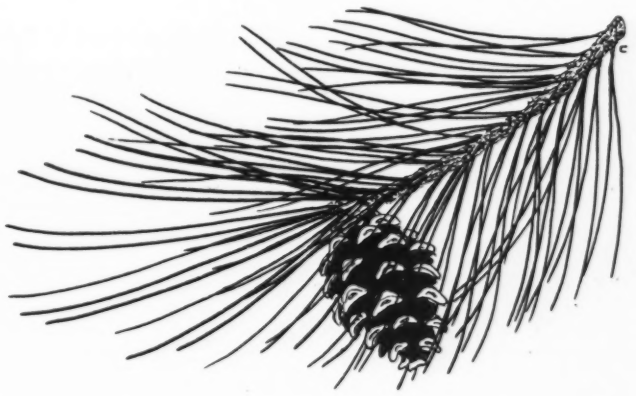
gether so students and visitors might easily find them. Unfortunately, such is not the case in the Arboretum, where one must walk nearly a mile to see these same trees.

As the day scheduled for the planting ceremony drew closer, more and more problems arose. Certain countries that were not expected sent delegations, and others sent regrets. Each tree chosen had to be passed by a protocol officer in order that no country be offended. Many times we made three or more choices before finding the right tree. Generally speaking, the trees were between three and six feet tall, and we tried to keep within these limits so no one tree would obviously overtop its neighbor. To illustrate these difficulties: *Fraxinus excelsior,* the European ash, was to represent the U.S.S.R., with *Larix sibirica,* the Siberian larch, as second choice. We were unable to locate the European ash, and the only Siberian larch was too small—less than three feet tall. Next we thought of *Betula middendorffii,* a Siberian birch available from our nursery. One was dug, but on closer examination it proved to be another and unsuitable species. We then picked out a nice plant of *Elaeagnus angustifolia,* Russian olive, but this was vetoed by the protocol people who feared that the local newspapers would make a play on use of an "olive" with its peace connotations at a time when relations between the U. S. and the U.S.S.R. were more strained than usual. In desperation we looked again at the Siberian larch; it seemed to have assumed additional stature during the interim and was deemed acceptable.

On September 3, 1960, foresters from sixty-five countries —in most cases the chief of each delegation, in picturesque uniform and accompanied by the flag of his nation—paraded down Campus Parkway. They took station before the trees, and as the name of a particular country was called, the representative planted the tree selected for his country. This most impressive and colorful ceremony made all the efforts of gathering the trees worth while.

Nation	*Common Name*	*Scientific Name*
Argentina	Roble southern beech	*Nothofagus obliqua*
Australia	alpine-ash	*Eucalyptus gigantea*
Austria	Austrian pine	*Pinus nigra*
Belgium	Norway maple	*Acer platanoides*
Brazil	Johnston eucalyptus	*Eucalyptus johnstonii*
Bulgaria	Tatarian maple	*Acer tataricum*
Burma	Oriental arborvitae	*Thuja orientalis*
Cameroun	Hinds walnut	*Juglans hindsii*
Canada	sugar maple	*Acer saccharum*
Chile	Dombey southern beech	*Nothofagus dombeyi*
China	China fir	*Cunninghamia lanceolata*
Colombia	Noble fir	*Abies procera (nobilis)*
Czechoslovakia	European mountain-ash	*Sorbus aucuparia*
Denmark	northern red oak	*Quercus borealis (rubra)*
Finland	European white birch	*Betula pendula (verrucosa)*
France	sycamore maple	*Acer pseudoplatanus*
Gabon	basket oak	*Quercus prinus*
Germany	European beech	*Fagus sylvatica*
Ghana	bigleaf maple	*Acer macrophyllum*
Greece	European hop-hornbeam	*Ostrya carpinifolia*
Guatemala	white pine	*Pinus strobus*
Haiti	sweet gum	*Liquidambar styraciflua*
Honduras	sugar pine	*Pinus lambertiana*
Hungary	European hackberry	*Celtis australis*
Iceland	Sitka alder	*Alnus sinuata*
India	Himalaya or Deodar cedar	*Cedrus deodara*
Indonesia	Golden chinquapin	*Castanopsis chrysophylla*
Iran	flowering ash	*Fraxinus ornus*
Ireland	white beam-tree	*Sorbus aria*
Israel	Oriental hornbeam	*Carpinus orientalis*
Italy	Montpelier maple	*Acer monspessulanum*
Ivory Coast	alpine fir	*Abies lasiocarpa*
Japan	Japanese red pine	*Pinus densiflora*
Jordan	Lindley cypress	*Cupressus lindleyi*
Korea	Korean pine	*Pinus koraiensis*
Lebanon	cedar of Lebanon	*Cedrus libani*
Liberia	red spruce	*Picea rubens*
Malagasy	Lodgepole pine	*Pinus contorta*
Malaya	paper-mulberry	*Broussonetia papyrifera*
Mexico	Patula pine	*Pinus patula*
Nepal	Smith spruce	*Picea smithiana*
Netherlands	little-leaf linden	*Tilia cordata*
New Zealand	red southern beech	*Nothofagus fusca*
Norway	Norway spruce	*Picea abies*
Pakistan	Himalaya horse-chestnut	*Aesculus indica*
Peru	boxleaf azara	*Azara microphylla*
Philippines	western red-cedar	*Thuja plicata*
Poland	Polish larch	*Larix polonica*
Portugal	Portugese laurel-cherry	*Prunus lusitanica*
Rumania	Macedonian pine	*Pinus peuce*
Spain	cork oak	*Quercus suber*
Sudan	Port Orford cedar	*Chamaecyparis lawsoniana*
Sweden	Scots pine	*Pinus sylvestris*
Switzerland	golden-chain tree	*Laburnum alpinum*
Thailand	Pacific madrone	*Arbutus menziesii*
Tunisia	Algerian fir	*Abies numidica*
Turkey	Turkey oak	*Quercus cerris*
Union of South Africa	western larch	*Larix occidentalis*
Union of Soviet Socialist Republics	Siberian larch	*Larix sibirica*
United Kingdom	English oak	*Quercus robur*
United States	Douglas-fir	*Psuedotsuga menziesii*
Uruguay	Englemann spruce	*Picea engelmannii*
Venezuela	eastern hemlock	*Tsuga canadensis*
Viet-Nam	Saghalin spruce	*Picea glehnii*
Yugoslavia	Serbian spruce	*Picea omorika*

The International Friendship Grove is nearly a year old, and most of the trees have put on a respectable growth. Each is marked with a small plaque identifying the tree and the country it represents. At the east end of the grove there are two flagpoles on which the flag of the United States flies side-by-side with the blue and white banner of the United Nations. And we sincerely hope that the example of these sixty-five trees growing together in peace will encourage the sixty-five nations they represent to do likewise.



The Instituto Botánico as seen from the palmetum; the windows are in the herbarium.
Insert. A water lily-pool in the patio adjacent to the herbarium.

THE BOTANICAL INSTITUTE AND BOTANICAL GARDEN OF CARACAS, VENEZUELA

By JULIAN A. STEYERMARK

Dr. Steyermark, of the Instituto Botánico, and specialist on *Rubiaceae,* was Curator of the Herbarium at the Chicago Natural History Museum from 1950 to 1958 and connected with that institution from 1937. He has written for scientific and popular publications, is author of *Spring Flora of Missouri* and co-author with Paul C. Standley of *Flora of Guatemala,* which has so far been published in eight volumes. He published four volumes on *Contributions to the Flora of Venezuela* as the result of botanical explorations in that country in 1943-45. Since 1944 he has explored the sandstone tablelands and was co-leader of the joint expedition of the Chicago National History Museum and The New York Botanical Garden that reached the summit of Chimantá Massif, the largest table mountain in Venezuela.

Dr. Steyermark is an honorary research associate of the Missouri Botanical Garden, a botanical consultant to Eli Lilly Co., an honorary member of Sociedad Venezolana de Ciencias Naturales and of Instituto Ecuatoriano de Ciencias Naturales. He has been an active leader in conservation through the Missouri and Illinois Nature Conservancy.

In recognition of his work on the flora of Guatemala, Guatemala is bestowing on Dr. Steyermark the Medal of the Order of Quetzal. It will be presented on his return to Venezuela.

NESTLED IN A PLEASANT MOUNTAIN VALLEY, facing the city proper and within its boundaries but hemmed in by the hills, lie the *Instituto Botánico* and *Jardín Botánico* of Caracas, capital of Venezuela.

For some time there has been a close relationship between this South American botanical institute and The New York Botanical Garden. Since 1944, Dr. Bassett Maguire, Head Curator and Coordinator of Tropical Research of The New York Botanical Garden, and others of the staff, have made many journeys to Venezuela and contiguous countries. These expeditions have explored the remote southern parts of Venezuela, from the borders of British Guiana and Brazil to the frontiers of Colombia, searching for new plants. These expeditions have had the generous financial support and interest of various friends of the Garden.

When these explorations began, Dr. Maguire maintained close relations with the late Dr. Henri François Pittier, founder of the *Instituto Botánico.* The connection has been continued through Dr. Tobias Lasser, now Director of the *Instituto* and founder (in 1945) and Director of the *Jardín Botánico.* Dr. Lasser attended the University of Michigan and pursued graduate studies under Dr. William C. Steere, now Director of The New York Botanical Garden.

The *Instituto Botánico* is housed in a building which stands within the grounds of the *Jardín Botánico,* and whose architecture is in keeping with buildings of the university *(Universidad Central de Venezuela).* The university supports and maintains the botanical garden. The institute is supported and directed by the Department of Renewable Natural Resources *(Recursos Naturales Renovables)* of the *Ministerio de Agricultura y Cria.*

The *Instituto* contains a herbarium, a library, lecture rooms, laboratories, and offices for members of the staff. The present staff includes Dr. Lasser, Director; Dr. Leandro Aristeguieta, curator of the herbarium and specialist on *Compositae;* Dr. Volkmar Vareschi, ecologist and specialist on ferns and lichens; Dr. Ernesto Foldats, specialist on orchids and marine algae; Dr. Zoraida Luces de Febres, specialist on grasses; and Dr. Julian A. Steyermark, specialist on *Rubiaceae.*

The building is modern, with fluorescent lighting; part of it is air-conditioned. The patios create a gay and charming atmosphere through colorful plantings, which are exposed to sun and rain throughout the year. In one, which is adjacent to the herbarium and offices, is a pool filled with ever-blooming, fragrant, purple and white water-lilies *(Nymphaea).* In other patios there are borders of purple-leaved *Setcreasea* and green-and-white *Chlorophytum comosum,* with backgrounds of graceful palms *(Chrysalidocarpus lutescens),* birds-of-paradise *(Strelitzia),* shell-flowers *(Alpinia),* and the decorative foliage of prayer-plants and other species of *Maranta.*

The herbarium *(Herbario Nacional de Venezuela)* contains approximately fifty thousand mounted specimens arranged in modern steel cabinets such as are used in herbariums throughout the world. The collection, begun by the illustrious Dr. Pittier, was the basis of his *Plantas usuales de Venèzuela* (1926), in which more than six thousand species of vascular plants were listed. The growing collection later provided the materials for the *Catálogo de la flora venezolana* (1945–1947) compiled by Pittier, Lasser,

The Instituto Botánico in the foreground, showing part of the palmetum and conservatories, with the City of Caracas and Avita Mountain in the background.

Schnee, Luces de Febres, and Badillo. Nearly ten thousand species were treated in this work. The herbarium now serves for present studies on the flora of Venezuela. Since the publication of the *Catálogo* many specimens have been added from the collections of members of the staffs of the *Instituto* and of the *Ministerio,* and by the expeditions of Dr. Maguire and his colleagues at The New York Botanical Garden. Many of these specimens represent genera and species new to science; many others are of genera and species new to Venezuela. It is estimated that the Venezuelan flora consists of at least twenty thousand species of vascular plants. This is considered a conservative figure; the number may be thirty thousand when all parts of the country are better known and have been more thoroughly sampled, and when all the plants have been more thoroughly studied. Indeed, despite the explorations mentioned above, the botanical study of Venezuela is only beginning. All parts of the country need thorough collecting. Its botanical resources seem inexhaustible, for each expedition comes back with a wealth of new discoveries. The newly discovered species are important not only to a knowledge of the flora of Venezuela, but also to our understanding of the distribution of plants over the earth and of the evolutionary relationships of genera and species. Moreover, they may provide new plants for studies in genetics, morphology, and physiology, and for economic and horticultural uses. The wealth of native species that await propagation in gardens and conservatories presents a tremendous challenge for coming years.

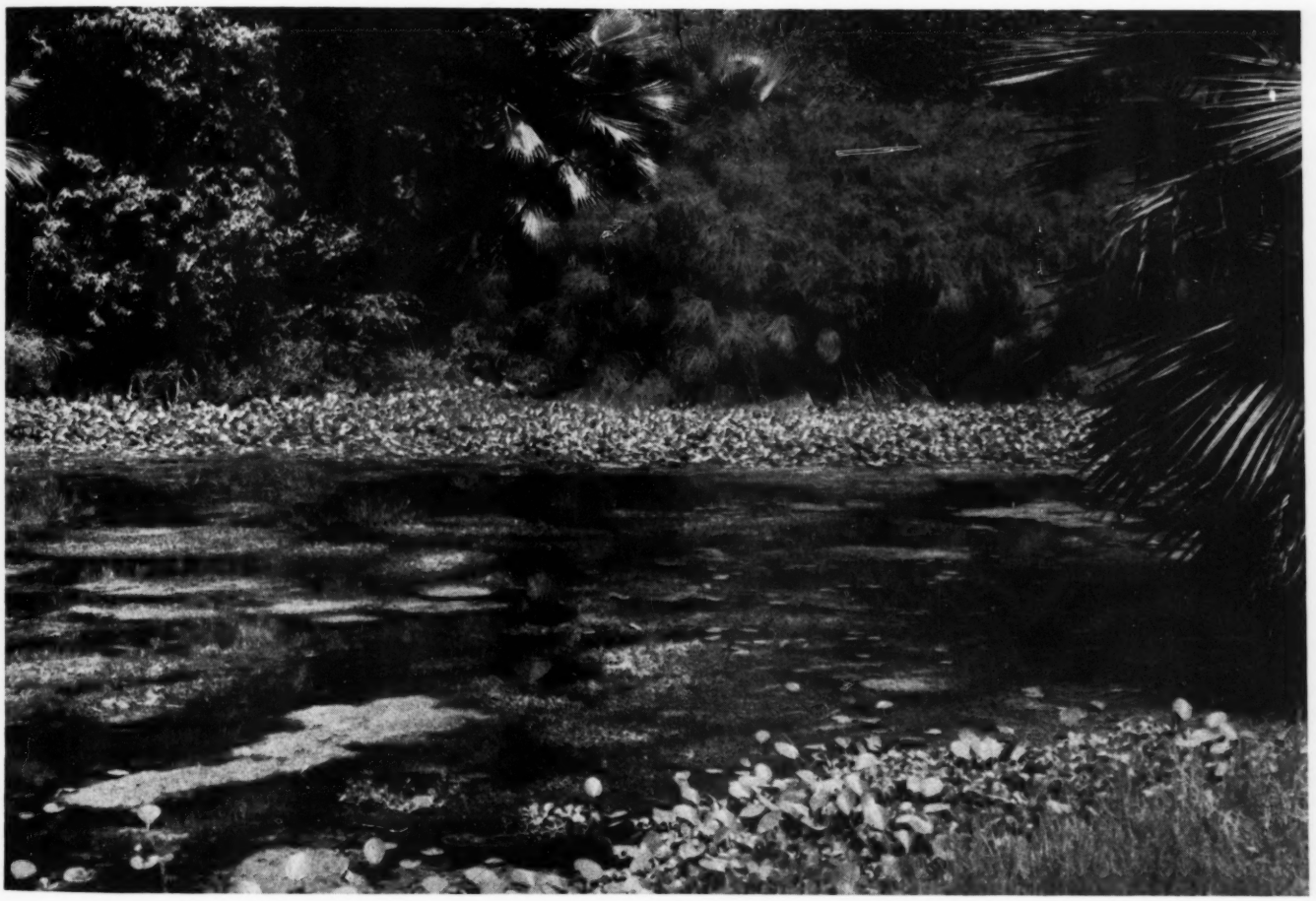
The *Instituto Botánico* is planning to produce an illustrated treatise on the flora of Venezuela, and since The New York Botanical Garden, through Dr. Maguire's work, has the largest and most important collection of Venezuelan plants, the *Instituto* collaborates closely with the Garden. The Garden, in turn, is planning eventual publication of a Flora of Guayana (an area that does not correspond to national boundaries but includes more than half of Venezuela), and is naturally associated with the *Instituto* in this project. As already stated, the herbarium of the *Instituto* has received thousands of specimens from the expeditions made by The New York Botanical Garden under Dr. Maguire. In exchange, the *Instituto* has sent sets of plants collected by members of its staff to the herbarium of the Garden. This constant flow of exchange specimens will undoubtedly continue between the two institutions.

The botanical garden of Caracas occupies seventy hec-

This thoroughfare for automobiles in the Botanical Garden is lined with *Roystonea regia*. Clumps of the yellow-flowered *Galphimia glabra* grow between the bases of the palms.

Above. *Washingtonia* palms around the margin of a lake with *Chrysalidocarpus lutescens* in the mid-foreground.

Below. The aquatic plants around this part of the lake include *Eichhornia crassipes* along the margin, *Cyperus papyrus* with Washingtonia palms, and *Salvinia, Azolla, Eleocharis,* and *Limnocharis.*



Hymenocallis and *Hippeastrum* border a path adjacent to the tropical forest.

Along a path in the tropical forest of the Botanical Garden--*Curculigo* at left and climbing-aroids on tree trunks.

tares (approximately one hundred and seventy-four acres) of largely hilly land. The hills are part of the northern slopes of a range of small mountains south of the Valley of Caracas. The purpose of the *Jardín* is to grow all the species, native and foreign, that can be grown in that place. Of about twenty-five hundred species now cultivated in the garden, some seventy per cent are native to Venezuela. The garden's altitude of approximately three thousand feet above sea level limits the number that can survive. Native species ordinarily found from sea level up to about four thousand feet maintain themselves and thrive. Those of the higher altitudes of the Andes and the paramos do not withstand the dry heat of Caracas, nor do many of the species of the cloud-forest. An attempt to grow some of the unique and ornamental plants from the sandstone plateaus and mesas of Guayana has mostly failed. But there is a great opportunity for adding rare and beautiful plants to those already cultivated in the *Jardín Botánico.*

The garden is in several parts: 1) the palmetum, in the southern section, includes nearly one hundred species of palms. An avenue of royal palm *(Roystonea regia)* borders a drive which leads to the *Instituto.* The Californian *Wash-*

Upper. *Agave, Yucca,* and cacti, with *Washingtonia* palms in the background, in the succulent collection.

Lower. *Sedum, Yucca, Pennisetum,* and cacti in the succulent collection.

ingtonia grows here, beside a pool; also *Sabal, Livistona, Elaeis,* and many others. Some produce flowers and fruit when quite young; others have showy clusters of scarlet or yellow fruits when only five or ten feet tall.

2) The succulent collection includes characteristic plants of desert and other arid regions, not only from Venezuela but from other parts of South America, and from Mexico and Africa. Rocks and bare areas provide a natural setting for many plants of *Agave, Aloë, Sedum, Kalanchoë, Crassula, Euphorbia, Opuntia, Cephalocereus, Stapelia,* and many other genera. Some of the plants that New Yorkers grow in their houses make here an outdoor display the year around. Such species as *Aloë arborescens,* which do not usually flower indoors in the northern United States, here produce tall, showy spires of scarlet blossoms outdoors. *Agave,* also *Yucca,* and other genera thrive outdoors in the *Jardín* and make a fine display of color with their diverse flowers.

3) The aquatic plant collection occupies several pools in the garden. Some pools contain water-lilies *(Nymphaea)* bordered by white-flowered *Sagittaria* and clumps of graceful *Cyperus.* Others are covered with water-hyacinth *(Eichhornia crassipes),* water-poppy *(Hydrocleis nymphoides),* or *Salvinia* and *Azolla,* bordered by Egyptian papyrus *(Cyperus papyrus),* spike-sedge *(Eleocharis),* blue-flowered *Hydrolea spinosa,* yellow-flowered *Jussiaea,* and *Washingtonia.* Still others grow moriche palm *(Mauritia)* flanked by clumps of the aroid *Spathiphyllum.*

4) The tropical forest is one of the very attractive parts of the garden. It is an extensive naturalistic planting of woody and herbaceous plants characteristic of a rain-forest. One walks in deep shade through a luxuriant cover of ferns, aroids, begonias, amaryllids such as *Crinum, Eucharis,* and *Hymenocallis, Marantaceae, Zingiberaceae, Musaceae,* and many other kinds of plants. The trunks of the trees are clothed with the various greens of climbing aroids *(Syngonium, Philodendron, Scindapsus, Monstera,* and others). Overhead are festoons of vines of the aroid, bignonia, and cucumber families. The forest canopy itself is made by such trees as miao *(Anacardium rhinocarpus),* matapalo *(Ficus),* copey *(Clusia),* jabillo *(Hura crepitans),* bucare *(Erythrina),* and caro *(Enterolobium).* Some branches are covered with bromeliads and orchids. The impression gained from some of the houses in the Conservatory of The New York Botanical Garden is reminiscent of the amazing effect of this forest in the botanical garden in Caracas.

Along some of the more open paths leading into the tropical forest, color is furnished by shade-loving plants such as *Hemigraphis colorata,* by the orange-red amaryllis *(Hippeastrum),* the fragrant, white spider-lily *(Hymenocallis),* the Amazon-lily *(Eucharis grandiflora), Neomarica northiana,* the red-flowered *Sprekelia, Trimezia, Zephyranthes,* and others. Planted in drifts, in the openings adjacent to these paths, the pink-, rose-, and white-flowered clumps of *Zephyranthes* or Atamasco-lily produce an effect in March and April comparable to that of crocus during their flowering period in the United States.

5) The collection of economic plants represents species,

Zephyranthes, or Atamasco-lily, resembles Crocus. Here many are in bloom in the Botanical Garden of Caracas at the time crocuses are flowering in early spring in the United States.

native and foreign, grown for food, medicine, horticulture, fibers, resins, gums, and latex. The plants are arranged in formal beds adapted to the instruction of university classes.

6) An orchidarium is situated on a slope above the tropical forest. The species represented are mostly Venezuelan. Because of the heat, it is impossible to grow orchids of the cooler Andean forests. And because of the dry air, most of the orchids of the moist cloud-forests cannot survive in Caracas.

7) There are two separate conservatories. In them more delicate plants are grown in a more humid air and are protected from wind and sun. A number of ferns, aroids, bromeliads, peperomias, begonias, gesneriads, and species of *Acanthaceae* thrive under these conditions.

8) A nursery is maintained for the propagation of the plants used in the various parts of the garden. Herbaceous plants and woody vines, shrubs, and trees are grown from seeds, cuttings, and leaves.

9) The arboretum is the largest division of the garden. A part of the valley is planted to foreign and native trees arranged by families. The rest of the arboretum covers the hills that rise above the *Instituto* and lend green cover and wild beauty to Caracas. With the adjacent forested park of Los Caobos ("the mahoganies," which dominate the park), and other parks scattered through the city, the wooded hills of the botanical garden help to maintain a healthful and purified air in the city itself.

The hills on the grounds have been reforested. In the original planting *Cassia siamea* and foreign species of *Eucalyptus* and *Casuarina* were used, but recently emphasis has been placed on native trees. About one hundred and fifty thousand trees have been planted in the last fifteen years, an average of ten thousand a year. The saplings from the nursery are set out on the hills and not watered, for the arboretum is too large for daily care. They must therefore be trees that can tolerate the dry season that prevails between December and mid-April. (Other parts of the garden are watered regularly during this season.) Within twenty years from planting, the saplings will have become large enough to make a true woodland. Some of the native trees used are species of *Ficus, Persea, Cassia, Clusia, Erythrina, Tabebuia,* and *Jacaranda.* The first two of these, and some others, hold their leaves through the year. The last three drop their leaves in the dry season but provide massed displays of orange, yellow, and purple. The commonest of the larger native trees already found on the hills are mahogany *(Swietenia),* fig *(Ficus),* bucare *(Erythrina),* and a number of leguminous species. The bucares are clad with brilliant orange blossoms; *Jacaranda* and some of the others have showy purple flowers.

This reforestation should serve to indicate which native species are best adapted to the deforested slopes of Avila Mountain. Each successive Minister of Agriculture has considered the reforestation of Avila of major importance; the *Jardín Botánico* expects to provide the knowledge necessary for the best results.

RESEARCH ON NEMATODES **(Continued from page 164)**

covery opened up new areas of study, and search began for other nematodes which attack plants from within or without. The search still continues.

Plant specialists have learned that nematodes are responsible for damage that has been ascribed to drought, flood, soil depletion, and other causes. The minuteness of the animals and their slow but steady population-growth has often caused plant-damage imperceptible to the grower.

Plant-damage is hard to evaluate accurately, since the feeding nematodes can carry with them virus colonies which may infect the plant with a particular disease. They have not been found to transmit bacteria, but their probing into plant cells may open wounds which can be infected by soil bacteria.

Asparagus seems to be unattractive to virtually all nematodes, and the marigold secretes a substance toxic to many of them. So effective is its ability to discourage invasion by certain nematode species that the marigold is now interplanted with tea in the plantations of Ceylon.

At Rutgers University, nematodes have been under study for many years, beginning with the observations of Conrad Hensler during his almost half-century of service in the College of Agriculture's Experiment Station. Entomologist Dr. Martin Hutchinson began the first full-fledged studies of nematodes in 1955 and laid the groundwork for the present operations of nematologist Dr. William R. Jenkins. Dr. Jenkins, who came to Rutgers in 1960 from the University of Maryland, considers the nematode one of nature's most fascinating creatures. His interest in them started at the University of Virginia, where he won his master's degree. His doctorate is from the University of Maryland.

Three specialists, Dr. Jack D. Tiner, Ronald A. Davis, and John P. Reed, and seven graduate-students round out Dr. Jenkins' staff. Research is being carried on in three general areas. Because of the economic importance, work on developing and testing new nematocides forms a substantial part of the program. The relationship between the nematode and its hosts, principally plants, is under study from its basic biological aspect, and a third area is the fundamental work on such phenomena as the inherent resistance of certain plants and the relatively greater resistance of certain strains of specific plants.

Dr. Tiner, whose research is supported by a National Institutes of Health grant, has been engaged in efforts to grow nematodes in sterile cultures so that they may be studied in an environment free from contamination and extraneous influences. With the aid of ingenious but elaborate apparatus, he has succeeded in raising the worms in a scientifically clean environment, opening the door to accurate studies of their basic biological functions.

An interesting line of study, which the scientists at Rutgers hope to pursue, is the infestation of insects by nematodes and the possibility of biological controls of insects by nematodes.

Another interesting study is being done by Dr. David Pramer, Associate Professor of microbiology. He is investigating the long-known phenomenon that particular soil fungi ensnare and eat nematodes. The fungi employ a variety of ingenious traps, ranging from microscopic lassos that encircle and grip the worms to adhesive-coated knobs or stalks that are as effective as flypaper. These highly specialized fungi are present in large numbers in the soil and

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Lonicera henyri is a well-behaved evergreen honeysuckle vine.

VINES AND GROUNDCOVERS FOR A LIMITED SPACE

By HAROLD O. PERKINS

Mr. Perkins, Emeritus Professor of Landscape Design, University of Connecticut, is now practising as a landscape architect in Storrs, Connecticut. He is also a member of the American Society of Landscape Architects.

PART I — VINES

IF YOU WERE ASKED to name three vines in quick order, the chances are that you would come up with wisteria, Boston ivy, and woodbine—or perhaps you would include trumpet-vine or climbing hydrangeas. All are good vines—in the right place; but that place is hardly the smaller house lot which predominates in present-day suburbia. These vines were used on and about the large mansions of another period. Modern living is somewhat more telescoped, and houses are smaller. In looking for plants to satisfy new needs, we should not be overly sentimental and insist on grandmother's favorite specimens. We should look at the new "compacts." Vines by their very nature are rampant, but there are varieties that are quite restrained in habit. It may take more hunting to find them in the market, but they will prove more satisfying over the years.

THE NEW "COMPACTS"

The vines to be mentioned are not new in the real sense of the word, for they have been known and grown in arboretums and botanical gardens for several decades. However, slow-growing plants have never been very popular with commercial growers, so that the more restrained vines are not as commonly available as they should be. (And for this, the price-tag-watching public should be blamed, not the nurseryman.)

Plantsmen occasionally find natural dwarfs of common species of trees and shrubs. This has happened less frequently with vines, but there are a few good ones that fit into the designer's kit. Lows ivy, baby and Kew wintercreeper, and small-leaf English ivy are dwarf clones of the well-known Boston ivy, wintercreeper, and English ivy.

Lows ivy *(Parthenocissus tricuspidata lowii)* has a smaller leaf than that of the type plant. The leaf is also more deeply cut, and its edge has a distinctive curl. The natural spread of this vine is less than a fifth of that of Boston ivy, and it is easily restrained to even less than that.

Baby wintercreeper *(Euonymus fortunei minimus)* has a dainty leaf that is little more than one-half inch long. The plant itself grows only a few feet high. The common wintercreeper *(Euonymus fortunei radicans)* has a leaf about twice the size of the baby wintercreeper, but this is still much smaller than the more frequently used wintercreepers, such as *E. f. vegetus* or *E. f. carrierei.* The common wintercreeper grows to fifteen feet or more. The smallest one of the group is Kew wintercreeper *(Euonymus fortunei kewensis)*; its leaf is less than one half inch in length, and the plant will grow about eighteen inches high. Kew wintercreeper provides a delicate pattern against a low wall or on a large stone in the garden.

Small-leaf English ivy *(Hedera helix minima)* is one of the smaller-leaved clones that is grown out-of-doors; it

tends to revert to the larger leaf found on the original type plant. *H. helix minima* is not reliably hardy north of New York City. The Baltic ivy *(Hedera helix baltica)* is one of the hardiest varieties and is commonly grown. It should be planted on the north side of a building and not be exposed to strong winds. If planted where the winter sun strikes it, "burning" will take place, and the plant may become completely defoliated in the spring. The Baltic ivy has a smaller leaf than the type and does not grow as tall, although it is still a large vine unless restrained.

Many vines would benefit from some restrictive pruning. By this I mean that the landscape design effect would be improved, if vines were thinned out and pruned back so that they would provide an interesting tracery of stem and foliage rather than a massive blob of leaves. Beautiful stone walls are all too often hidden by a curtain of green when vines are permitted to do "what comes naturally."

All these vines have rootlike holdfasts that will cling to a masonry surface. They should not be grown over a wooden structure, since they would cause considerable damage. Except for the Lows ivy, the vines discussed so far are evergreen.

A Honeysuckle That Stays Put

Honeysuckle vines have the reputation of being rambunctious, a reputation that has been well established by the commonly used Japanese honeysuckle. But we should not cross off our list all vines with the name honeysuckle. Henry honeysuckle *(Lonicera henryi)* is deserving of a better fate. It resembles its more infamous cousin from the Orient, but its mature height of fifteen feet would rate it as a small vine. It is completely evergreen, and the moderately wide spacing between the leaves shows the stem to advantage. Except in cold winter weather, when its moderately large leaves roll up tightly, it is a well-behaved vine. True, the dull bluish pink flowers leave something to be desired, but the large cluster of firm dark blue berries is a real surprise. The fruit with a section of the stem can be used to make interesting arrangements for the table in early winter.

There are three non-evergreen vines suitable for limited space. The trio is composed of akebia, clematis (large-flowered hybrids), and turquoise berry. Although the akebia and the turquoise berry may ramble out of bounds, a little timely attention will keep the plants under control since the stems are slender and easily cut. The foliage of both has interesting outlines and creates an impression of lightness, even though the leaves are not really small.

The leaf of akebia *(Akebia quinata)* is made up of five fingers, each held on a small stem. The dark green color gives it a rich appearance. This vine provides light shade for an arbor or a tracery of green on a downspout or fence.

Turquoise berry *(Ampelopsis brevipedunculata)* has a three-lobed leaf. The grape-like cluster of fruit always attracts the eye. The berries in an individual cluster ripen at different times; some resemble a small robin's egg, both as to color and spotting, while others are pale green, lavender, or blue-black. The related monkshood vine *(Ampelopsis aconitifolia)* has a more delicately cut leaf, but its fruit is not as interesting. You may take your choice: delicate leaf pattern or interesting fruit.

Akebia quinata.

Parthenocissus tricuspidata.

The large-flowered hybrid clematis are the glamour vines of the mid-century period. There is a good range of clear colors and the beautifully formed flowers are real attention-getters. The fact that they may measure six inches, or even more, in diameter does not lessen their attractiveness. The stamens and pistils at the center are worthy of a closer look. In some varieties they have the appearance of a queen's crown, and this, set against a royal purple or ermine background of sepals, is beauty at its finest. The next opportunity you have, why not take that second look? Most vines are rugged individuals and require little in the way of care. Clematis is more exacting in its cultural requirements; but, after all, royalty is deserving of attention.

Vines have been playing a secondary role in landscape plantings within recent years. If a switch were made from the standard fifty-foot by fifty-foot vine, and some thought were given to thinning, we could again enjoy the tracery patterns and the softening touches that vines provide.

PART II — GROUNDCOVER PLANTS

GROUNDCOVER PLANTS are favorites of today's amateur gardeners. They look to these plants for an easy solution to their garden maintenance problems and expect them to grow where nothing else has grown before. True, many of the groundcover plants will thrive in problem areas, but even they require some attention, and especially while they are becoming established. We should never be too hasty in dismissing the use of turf areas; we must recognize that grass will take more punishment than any other groundcover when it is walked on. The lawn mower is the great leveler to a weedy lawn, so that some weeds can easily masquerade as grass. And herbicides have been developed for use on turf areas. However, they cannot very well be used to eliminate weeds in a groundcover planting.

The recent lavish use of groundcover plants has been wonderful for gardeners of large lots as well as small. Just don't expect too much, however; groundcover plants are not really the long-sought answer for the no-work, hammock gardener.

Ampelopsis brevipedunculata.

Clematis 'Lady Carolina Neville' is a delicate mauve, pale enough to be called French-gray or French-white, with a somewhat darker mauve bar down the center of each petal.

So many kinds of plants can be used as groundcovers that it will simplify matters if I classify them into several groups and then narrow the discussion to a few of the more refined varieties.

WOODY OR HERBACEOUS TYPES

Groundcover plants may be woody or herbaceous. The woody group can be deciduous or evergreen, with the latter group subdivided into needle-evergreen and broad-leaved evergreen. The herbaceous perennial group can be divided into non-evergreen and evergreen. In this discussion, since space is limited, only the various types of evergreen foliage plants will be mentioned. This automatically eliminates some of the weedier plants, and some very choice plants will also automatically be excluded.

The broad-leaved evergreen woody plants are universal favorites and are popular items in the garden centers. Myrtle or small-leaved periwinkle *(Vinca minor)* has been used for hundreds of years, and its dark green color gives a richness to almost any planting. It will grow under deciduous plants to give winter color and to lessen any ungainly effect that a leggy plant may possess. 'Bowles Variety' forms a clump and thus is not as spreading as the type. It has a larger flower.

Baltic ivy *(Hedera helix baltica)* has a dark green leaf. It should not be used on the south side of a building, but

as a groundcover it will withstand partial sun better than it will when used as a vine. That its small-lobed leaf has appealed to artists as well as gardeners is evidenced by its wide use in scrolls and architectural decoration.

Japanese spurge *(Pachysandra terminalis),* compared to myrtle and Baltic ivy, is a newcomer; it was popularized by landscape architects not many more than twenty-five years ago. Today, even its scientific name is a household word. *Pachysandra terminalis variegata,* with a two-tone leaf in creamy white and green, sends out few underground stems and so is very slow in filling in an area.

Purple wintercreeper *(Euonymus fortunei colorata)* is one of the hardiest of the broad-leaved evergreen group and one which does well in the Midwest. The leaves turn a purplish red when cold weather comes, and this color is retained throughout the winter. At other times, the leaf is a dark green.

Silveredge wintercreeper *(Euonymus fortunei gracilis)* is a variegated form combining green and white. The irregular white edging contrasts nicely with the dark green of the leaf. The leaf is small, little more than an inch in length. The silveredge wintercreeper is a slow grower, so the plants should be placed quite closely.

Variegated forms are commonly ignored by garden designers. However, in a dark corner a plant with white edging gives lightness and gaiety to the scene. If a quick cover of a variegated plant is wanted, one should look to the nonevergreen herbaceous perennials and especially to selected clones of *Hosta, Ajuga,* and *Aegopodium.*

Most broad-leaved evergreens do best in partial shade, but bearberry *(Arctostaphylos uva-ursi)* thrives in sun and sandy soil. Unfortunately, it is difficult to transplant and is slow in becoming established. The small leaf of the bearberry permits a pleasing change of texture. Another native that has a leaf of similar size is coming into garden centers in increasing numbers. This newcomer is shore cowberry *(Vaccinium vitis-idaea majus).* Its glossy leaf and dark red berries are most attractive. It does not spread rapidly; it would therefore be used only in small areas. That it will thrive only in areas with an acid soil places some limitation on its use.

Sargent juniper *(Juniperus chinensis sargenti)* is a low evergreen groundcover for poor dry soil.

Junipers for Sun

The several prostrate junipers are the answer to the question, "What can I use on a sunny bank—something that will not take over the place?" (Since junipers do insist on sun, if some taller plant is used nearby, its growing, spreading branches will kill out the juniper.)

Many selections have been made of Bar Harbor juniper. Several of these are better than the type and certainly they are easier to find in nurseries and garden centers. Wilton juniper *(Juniperus horizontalis glauca)* is one of the choicest. Its new foliage is a pleasing bluish gray, and it retains a good green tone all winter instead of turning a smoky purple as does the original species. A mature plant is little more than a foot high, and its total spread may be at least four or five feet. Andorra juniper *(Juniperus horizontalis plumosa)* will grow two feet tall and is of a looser habit than others of this type. It grows quite rapidly. These two are selections of plants that were originally found around Bar Harbor, Maine. The latter plant was named for the Andorra Nurseries of the Philadelphia area. Sargent juniper *(Juniperus chinensis sargenti)* is yet another of these low spreading evergreens that have not been used as much as they should be.

Actually, many good plants have not been able to break the economy barrier. Nurserymen must live, meet a payroll, and answer to the tax man. So "bread and butter" plants continue to be popular largely because they can be bought at attractive prices. Since garden centers are geared to serve a large public, they tend to stock only those plants that sell quickly. Another choice plant that has lost out in the current market is the spreading English yew *(Taxus baccata repandens).* It is so much hardier than other English yews that a few plantsmen question its classification. Some yews may become somewhat leggy, but never this plant—it is always full to the ground. In fact, if it is planted at the top of a wall, its pendulous branches will trail several feet below.

Evergreen Perennials

If there is one classification of plants that has been neglected, it is the evergreen herbaceous perennials. Yet

Andorra juniper *(Juniperus horizontalis plumosa)* forms a low, flat mass. Here *Lavendula* edges the planting.

among them are some very neat and interesting plants. They are frequently "off-beat" plants, yet of good family. Sometimes they are conversation pieces and have a story to tell.

Oconee-bell *(Shortia galacifolia)* is such a plant. Its rounded, glossy leaf is most attractive, and its white bell-like flowers early in the spring make one want to get down on hands and knees to take a closer look. As for its story—Dr. Asa Gray, the renowned botanist, spent years and years hunting for this "lost" plant in its native South Carolina where only limited colonies of it existed. *S. galacifolia* is hardy into New England, but give it shade and some moisture in the summer.

Galax *(Galax aphylla)* is somewhat similar but has a larger leaf and bears a white spike-like bloom in summer.

European wild ginger *(Asarum europaeum)* has a heart-shaped, very dark green, and glossy leaf that is smaller than the leaf of our native wild ginger. The plant makes a dense mat of foliage and prefers shade, summer moisture, and a good soil.

A new interest is developing in hen-and-chickens or houseleeks. It may surprise some of my readers to learn that these succulents are so winter-hardy that they flourish without protection into central New England. As these plants spread, they make a compact mat. The variation in size of plants and in the taller flower shoots furnishes a beautiful pattern. Sempervivums combine nicely with a pebble area or can be set off well near paving or a mulched area of vermiculite. They produce a rosette of foliage. Some varieties have a large rosette, while others have quite small rosettes; some have an interesting spider-web effect at the center; others are tipped with reddish purple, or the entire leaf may be colored. Here is an old-fashioned plant that can be used to give a modern touch to the garden. One of the more common large houseleeks is *Sempervivum tectorum;* one with a small rosette of foliage is *Sempervivum flagelliforme.* The latter has pale green pulpy leaves with no touch of red on the tips.

So many plants can be used as groundcovers that it is well to look at trial plantings before you make your final selection. There are at least two such trial grounds where many plants are displayed. One is at the Morton Arboretum in Lisle, Illinois, and the other is at the Case Estate (of the Arnold Arboretum) in Weston, Massachusetts. Study these and other display plantings. Look once for height and matting quality, once for color, and then half close your eyes and study the textural quality.

RESEARCH ON NEMATODES (Continued from page 177)

are doubtless one of nature's controls of the nematode population. They have remained largely scientific curiosities, but Dr. Pramer is keenly interested in the possibilities of putting them actively to work in the continuing battle against the nematode.

The program of basic research on the nematode and its practical control, which is engaging the attention of the Department of Entomology at Rutgers, is of real interest not only to agriculturists but to horticulturists. The Department is concerning itself with nematodes that attack ornamental plants as well as those that attack farm crops. Fieldwise, about fifty shrubs are being given what Dr. Jenkins described to the Editor of *The Garden Journal* as "shot-gun" treatments with nematocides. These treatments are being observed for the specific control of nematodes and for any effects, good or ill, that they may have upon particular shrubs. Among the ornamentals in these tests are several species and varieties of hollies, yews, boxwood, forsythia, roses, and carnations.

The above is based on *A Brief Report from Rutgers, The State University,* May, 1961.

European wild ginger *(Asarum europaeum)* is used as a groundcover in the Thompson Memorial Rock Garden of The New York Botanical Garden.

A SHRUB BORDER IN A SOUTHERN GARDEN

By JUNE RAINSFORD HENDERSON

June Rainsford (Mrs. Peronneau Finley) Henderson, horticulturist, author, and lecturer, has seriously pursued her hobby ever since she became interested in gardening at her grandmother's home in Edgefield, South Carolina. While engaged in research at the Library of Congress in Washington, D. C., she gathered information on eighteenth-century gardens. In 1938 her book *Floralia, Garden Paths and Bypaths of the 18th Century,* was published by the University of North Carolina Press. Appropriately, her home and garden in Aiken, South Carolina, are named "Floralia." Mrs. Henderson has received awards from the Garden Club of South Carolina, of which she is a former president, and from The Garden Club of America.

MORE THAN A DOZEN YEARS AGO a combination of time for gardening and an area in which to garden offered an opportunity to indulge in a planting project that had long been taking place in my imagination.

The eastern border of our property measures two hundred feet. The width of the border was to be determined by the type of plants that I wanted to use. After some experimentation, a width of fifteen feet proved adequate. A substantial brick wall opposite the house and from the end of that a hedge of cherry-laurel, *Prunus laurocerasus,* which extended to the end of the property line, formed a satisfactory background for the new planting. The only established plant in the border was a *Photinia glabra.* Although it was out of scale for a time, pruning brought it into bounds, and the lovely foliage has justified its retention.

My first difficulty was the choice of plant material. The climate and soil of this middle region of South Carolina make it possible to grow a wealth of evergreens as well as deciduous flowering shrubs. No truly southern planting can be made without camellias, azaleas, boxwood, hollies, and tea-olives *(Osmanthus),* which are among those plants most characteristic of this section of the country. Since the area to be planted was limited, my selection of plants was necessarily limited. I had been interested in hollies for some time and had nice specimens of different varieties growing in random spots about the place, so I decided to make this species the dominant evergreen. This has proven a happy and satisfactory choice.

With the exception of *Ilex vomitoria,* or yaupon, as I prefer to call it, I felt that the native American hollies attained too great a size for my restricted planting. I decided to use, for the most part, those from the Orient that thrive so well in this climate. *Ilex cornuta,* the Chinese holly, and *I. latifolia,* the Japanese holly or tarajo, were chosen for accent. These were planted at intervals in the back of the border where they would lend height, and they have been cultivated to become dominant. The rich, dark green leaves of *I. cornuta* with their many spines have been an interesting contrast in size, texture, and color to those of *I. latifolia,* which are from three to four inches long, leathery, and a lighter green.

A firm decision, made long before work began, was to use in the border only those plants that bear white blossoms. Azaleas were my first selection. Between the accent hollies, I measured areas fifteen feet long, and in these I planted Kurume and Indian azaleas. Flowers of the Kurume group, much smaller than those of the Indian, make up in profusion what they lack in size. From the Kurumes I chose the varieties 'Snow' and 'Snowflakes'. (I still do not know whether they are one and the same.) 'Snowflake' was on the list of original introductions of Kurumes made by the late Dr. Ernest H. Wilson, who was solely responsible for making this lovely variety known to American gardeners. My Kurumes have proven to be dense, compact growers and very free-flowering. Each year for from two to three weeks in March the bushes are completely covered with snow-white blossoms. The double hose-in-hose flowers seem to last longer than the single ones.

Between the Kurumes and the background hedge I planted Indian azaleas, which are large-flowered, evergreen, and taller-growing than the Kurumes. The azaleas that have made "Magnolia," "Middleton," and other gardens around Charleston famous belong to this group. I selected two varieties which are strong-growing and very hardy, 'Fielder's White' and 'Indica Alba'. Both produce large, pure white blooms; as the former comes into flower ahead of the latter, the season is extended. Five years ago a severe late-spring freeze did great damage to all the Indian azaleas in this region. However, those that were not killed outright made rapid recovery, and this past spring there was no evidence of damage.

Cydonia or flowering quince has long been a favorite—because it is dependable for blooms from late winter into spring—and so the white-flowered variety was my first choice among the deciduous shrubs. It is best displayed in group plantings of three plants to a group. The evergreen background is not only satisfactory when this shrub is in flower, but also when it is dormant, for the flowering quince is straggly in growth habit.

Two deciduous natives, *Cercis* or Judas-tree and *Callicarpa* or beauty-berry, grow abundantly throughout the South. Each has a white form that is rare and very beautiful. White Judas *(Cercis canadensis alba),* as also *Cydonia,* furnishes when dormant a pleasing contrast with the evergreens; in spring the bare branches are covered with exquisite small white blossoms. The dense clusters of white berries on the leafless stems of *Callicarpa* in early autumn are unusual and very ornamental. This plant is difficult to procure and difficult to grow, but any measure of success is worth the effort. Another deciduous shrub that belongs in the same category of difficult to grow but rewarding is *Stewartia.* Among the several species is *S. malacodendron,* native to South Carolina and other southern states. The foliage is handsome, and the flower, resembling a glorified single white camellia, is very showy; its center is a crown of reddish purple stamens. *S. malacodendron* will in time reach the size of a tree, but so far mine has remained shrublike in proportion.

Ilex latifolia is used as an accent shrub and *Ilex crenata helleri* as an edging in the author's shrub border.

After the large evergreens and flowering shrubs were settled in their places, there were voids to be filled. Yaupon, the small-leaved native, was the only American holly to be given a place in the border. An occasional plant of the Chinese *Ilex pernyi* was added, primarily because it is slow-growing and because its small spiny leaves lend an unusual note. The low-growing Japanese hollies were most useful as fillers, and for this purpose I chose *I. crenata rotundifolia* and *I. crenata microphylla.* However, in my opinion, *I. crenata helleri* is superior to all hollies in this class. It is unexcelled as a border plant, because of its increasingly solid mound of green leaves. It has been used as an edging in front of the large hollies, while ivy borders the azaleas.

I did not adhere to the pattern of planting, as described above, for the terminal fifty feet. Since this area extends beyond the house, there is enough space to accommodate larger plants. The white-blooming magnolias, *M. stellata* with its fragile starlike flowers and *M. soulangeana alba,* furnish variety to the masses of bloom produced by spiraeas, *Philadelphus* or mock-orange, and *Exochorda* or pearl-bush.

For a stretch of about forty feet opposite the long border and along the side of the house is another planting of green and white which is more specialized. This little garden, which can be seen from the dining room, gives much pleasure when in bloom. A large *Elaeagnus pungens fruitlandii,* whose dark green leaves have bright silver under sides, fills the corner where the bow-window projects from the house.

For this border I have again used *Ilex cornuta* as the center, flanked on each side by *Podocarpus.* These have been kept trimmed to form narrow columns. Lower in height than the holly and planted equidistant to make a loose semicircle are eight specimens of *Camellia japonica.*

Since few white camellias stand the cold weather very well, varieties were chosen for their hardiness rather than for the spectacular size of their blooms. These were also selected because they can be counted on to bloom at approximately the same time: 'Leucantha' or 'Tricolor White', which produces a shower of single white blooms; the semi-double 'Louise-Onetta' and 'Imura', both dependable; and two seedlings, 'Eleanor Merry' and 'Adelaide', which are equally as good as 'Leucantha' and perhaps more cold-hardy. These seedlings are gifts from my daughter's garden.

Since I feel that camellias need accompanying bloom, I sought a variety of azalea (most of them bloom after the camellia season) and was rewarded when I found the early-blooming Glenn Dale hybrid called 'Cantabile'. It does not give profusion of bloom, nor are the individual flowers very large, but 'Cantabile' is apparently quite cold-resistant and fills the area around the camellias very acceptably. Another Glenn Dale hybrid, 'Treasure', which does have spectacular large white blossoms, fills in some spaces and blooms with the tulips. These are planted in a double row just back of dwarf English boxwood *(Buxus suffruticosa).* Between the boxwood and the old bricks that edge the border the hardy perennial *Iberis sempervirens* or candytuft can be relied on for a broad mass of blooms each spring. *Vinca minor alba* is used as a groundcover wherever one is needed.

Naturally within a limited area it has been necessary to omit some very desirable plants. There is constant moving and replacing of shrubs. For example, loquat *(Eriobotrya japonica)* is one of my favorite evergreens, and I like to have two or three growing in the border. Their large interestingly veined leaves contrast with the other foliage nearby. Loquat grows slowly until it is five or six years old and can be kept to a single stem; after that it develops rapidly into a large spreading shrub. When this development begins, the plant is moved out and given to a friend or planted near the southern boundary at the back of our place. A year ago a nurseryman bought two hollies that were getting out of bounds, to plant on an estate nearby. To take their place I put in shrubs that will never attain the size of the hollies.

In creating my borders I have had three aims: first, for a green effect in winter; second, for a wealth of bloom in spring; and third, for as much ease of maintenance as possible during summer. I have attained a certain measure of success, but I am still learning. After a decade some of the planting looks quite finished, but there is still opportunity for further experimentation.

BOOK ORDERS

Books reviewed in *The Garden Journal* or any other book on botany, horticulture, nature study, conservation, flower arranging, or kindred subjects may be ordered through Book Service.

Members are entitled to 10% discount on the list price.

When you place an order for books, please send check or money order, made out to The New York Botanical Garden, to Book Service.

BRIEF NOTES ON RECENT BOOKS

By ELIZABETH C. HALL

Miss Hall is Sarah Gildersleeve Fife Research Librarian of The New York Botanical Garden.

CONSERVATION, NATIONAL PARKS, SCIENCE PROJECTS, ETC.

FOREST MANAGEMENT; 2nd ed. Meyer, H. Arthur and others. 282 pages, illustrated, indexed, bibliography. Ronald Press Co., New York. 1961. $8.50

Since the first edition in 1952 there has been a marked transition from forest exploitation to sustained-yield management. This updated revision emphasizes the progress in forest regulation. Examples of management plans are presented for forests of various sizes in Massachusetts, Tennessee, Idaho, and California.

THE LIGHTNING BOOK. Viemeister, Peter E. 316 pages, illustrated, indexed, bibliography. Doubleday and Co., Garden City, N. Y. 1961. $4.50

This fascinating account, written for the layman by a technical engineer, includes history, superstitions, present-day findings, and practical advice on protection from lightning.

OUR COUNTRY'S NATIONAL PARKS; 50 STATES EDITION. Melbo, Irving Robert. 2 vols. 278, 278 pages, illustrated, indexed. Bobbs-Merrill Co., Indianapolis, Ind. 1961. per vol. $4.50; set $8.00

This new edition of a favorite work for young and old offers a full chapter on each of our twenty-nine national parks. Pleasant chatty accounts full of anecdotes, history, folk lore, and beautiful photographs.

OUR NATIONAL PARK POLICY: A CRITICAL HISTORY. Ise, John. 701 pages, maps, bibliography, indexed. Johns Hopkins Press, Baltimore, Md. 1961. $10.00

Richly documented account published for Resources for the Future, Inc. Mr. Ise has devoted many years to the analysis of conservation problems. His *United States Forest Policy* and *United States Oil Policy* are indeed conservation classics.

THE SCIENTIFIC AMERICAN BOOK OF PROJECTS FOR THE AMATEUR SCIENTIST. Stong, C. L. 584 pages, illustrated, indexed, maps, bibliography. Simon and Schuster, New York. 1960. $5.95

A how-to-do-it book of hundreds of fascinating projects in biology, physics, chemistry, mathematics, astronomy, archaeology, and geology. Those botanically minded should find of interest "Growing Algae on a Window Shelf," "How to Cultivate Harmless Bacteria," and "Chromatography."

THINGS TO DO IN SCIENCE AND CONSERVATION. Ashbaugh, Byron L. and Beuschlein, Muriel. 163 pages, illustrated, indexed, bibliography. Interstate Printers and Publishers, Danville, Ill. 1960. $2.50

Simple as well as more advanced experiments are suggested. A large range of subjects, such as sun, soil, air, water, minerals, plants, animals, space, electricity, synthetics, and nuclear energy. Information sources and teaching aids listed. Conservation stressed throughout.

FOR YOUNG READERS

THE BEGINNING GARDENER. Cutler, Katherine N. 173 pages, illustrated, indexed. M. Barrows and Co., New York. 1961. $2.95

Mrs. Cutler's *Junior Flower Arranging* published in 1954 has been found a very useful text for young arrangers and for leaders of Junior Garden Clubs. The author had wide experience as the first state chairman of Junior Gardening in New Jersey. Her recent book should be well received. A helpful section contains a list of some of the requirements for Girl Scout badges that pertain to botany and gardening.

FRUITS WE EAT. Fenton, Carroll Lane and Kitchen, Herminie. 128 pages, illustrated, indexed. John Day Co., New York. 1961. $3.50

This is the third book by the authors of *Plants That Feed Us* and *Animals That Help Us*. Dr. Fenton's illustrations are wonderfully done, with a pleasing softness. Mrs. Kitchen, Specialist Emeritus in Agricultural Information at Rutgers University, offers accurate facts, delightfully told. Over a hundred fruits are illustrated and described from temperate, tropical, and sub-tropical regions.

MY EASY-TO-READ TRUE BOOK OF TREES. Podendorf, Illa. 43 pages, illustrated (part colored). Childrens Press, New York. 1960. $1.00

For those just beginning to read.

NEW WORLDS THROUGH THE MICROSCOPE. Disraeli, Robert. 175 pages, illustrated. Viking Press, New York. 1960. $4.00

A revised edition of the 1939 edition of *Seeing the Universe* with expanded text and many new photographs. A strikingly complicated unseen world told and illustrated simply and expertly.

THE TALE OF A POND. Kane, Henry B. 121 pages, illustrated, indexed. Alfred A. Knopf, New York. 1960. $3.00

Equally charming and enchanting as Mr. Kane's previous title *The Tale of a Meadow*. Fresh water biology described and illustrated with dramatic feeling.

THERE STAND THE GIANTS: THE STORY OF THE REDWOOD TREES. Weaver, Harriett E. 70 pages, illustrated (part colored). (A Sunset Junior Book) Lane Book Co., Menlo Park, Cal. (Distributed in the East by J. B. Lippincott Co., Philadelphia, Pa.) 1960. $2.95

Ages 9 to 12 will like this fascinating story of the world's most famous trees. The author was formerly Ranger and Park Naturalist in Big Basin Redwoods State Park.

THE TREES AROUND US. Tee-Van, Helen Damrosch. 63 pages, illustrated. Dial Press, New York. 1960. $2.50

An exquisitely illustrated book, adapted from Coronet Instructional Films by Mrs. Tee-Van, well-known illustrator of undersea life in connection with Dr. Beebe's expeditions in the tropics. Although written for the primary grades, older readers will learn much about trees from the charming pictures and text.

UNDER THE SEA. Burton, Maurice. 256 pages, illustrated (part colored), indexed. (Illustrated Science Books) Franklin Watts, New York. 1960. $4.95

The inhabitants of the sea which dwell near the surface and in the very depths—from diatoms to whales, from the earliest geological periods, from North to South, from East to West. An exciting volume with "out-of-this-world" illustrations.

WESTERN BUTTERFLIES. Smith, Arthur C. 65 pages, illustrated (part colored), indexed. (Sunset Junior Book) Lane Book Co., Menlo Park, Cal. (distributed in the East by J. B. Lippincott Co., Philadelphia, Pa.) 1961. $2.95

Some of the butterflies mentioned are also found in the East. The table at the end of the book clearly indicates the range as well as the flight season and the plants on which the larvae feed. Well illustrated in color. A captivating title for butterfly hobbyists.

FOLKLORE AND SYMBOLISM OF FLOWERS, PLANTS AND TREES. Lehner, Ernst and Johanna. 128 pages, illustrated. Tudor Publishing Co., New York. 1960. $4.75.

This book is divided into five sections. Treated in the first three sections are: 1) Sacred Plants; 2) Flower Lore and Legend; 3) Strange and Wondrous Plants; and these plants are arranged in alphabetical order by common name. The Flower Calendar contains the seasons, traditional English flowers of the month, Chinese flower calendar, and Japanese flower calendar. The last section—The Language of Flowers—lists several hundred plants in alphabetical order, by common names, noting their sentiment and symbolism for Occidental, Islamic, and Oriental peoples.

The author, Max Lehner, is known as a compiler of symbols. This subject he seems to know well. Unfortunately, his knowledge of botany is not comparable. The black and white illustrations, mainly reproductions of woodcuts from sixteenth to eighteenth century herbals, are exquisite; but, alas, the text is taken almost verbatim from the works that carried the illustrations. Many of the herbalists and historians quoted, especially Pliny, are known to be unreliable. As a result, the factual information that we seek in a work of this kind, such as proper spelling, identification, correct scientific binomial, origin, history, and use of plants is erroneous in the light of today's knowledge. For instance: the ancient silphium plant *(Ferula narthex)* is not only misspelled *(Sylphium)* but we are told that it doesn't exist any more. In fact this is a close relative of asafoetida and a very prolific weed in north Africa today. Arborvitae (tree of life) is the name of a *Thuja* native to the American Pacific Coast and some islands of the Pacific Ocean. It could not have been known to the people of Asia Minor in Biblical times. None of the species today recognized as possibly being the "crown of thorns" is mentioned. Most of the plants cited were not known in the Holy Land during the first century. The pomegranate (one of Lehner's three blessed fruits) is not listed in the table of contents. It was brought to China from Samara-

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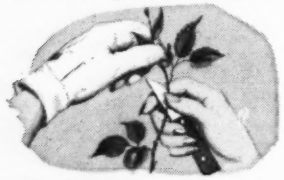

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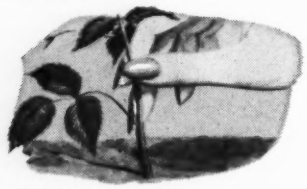

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kand, a city of Asiatic Russia, and not from Kabul in Afghanistan. *Persea* is a genus of plants which are members of the *Lauraceae*. Forty-nine of the fifty known species are native to Latin America. The other plants of this genus are native to the Canary, Madeira, and Azores islands. The best-known species is the avocado *(Persea americana)*. *Balanites aegyptica* or betu is not a *Persea*, but a member of the caltrop family or *Zygophyllaceae*. Shamrock can be any one of four different plants with clover-like leaflets. The Japanese flower of the month of August could not possibly be a "hill crest" with a moon. It is iris, rose moss, or morning-glory depending upon locality, tradition, and time in history. The book does not list American Birthday Flowers or American Flowers of the Month.

It is realized that the sentiment and symbolism for all known species cannot possibly be mentioned in such a small volume; but when several hundred are listed and such favorites as angelica, baobab, barley, basil, bittersweet, bulrush, camphor, Christmas-rose, cornel cherry, dittany, elm, flax, gourd, henna, hyssop, monkshood, parsley, potato, radish, stock, wheat, wormwood, and yarrow are missing, there are inexcusable gaps.

JOHN ASCH
NEW YORK, N. Y.

FLOWER PAINTING, ITS ART AND TECHNIQUE. Zichy, Countess. 112 pages, illustrated in color and monochrome. Watson-Guptill Publications, Inc., New York. 1961. $9.75.

Countess Zichy has written a splendid book which would-be flower painters should find most helpful and encouraging. And there are numerous points which professional painters will find useful, too. Illustrated step-by-step demonstrations show the evolution of a picture from the flower arrangement as a still life set up to a finished oil painting. One thing which these demonstrations show very nicely is that one indeed does not copy the model before him.

Notes are included on framing and on the handling of watercolor, pastel, and cassein.

Among the seven color plates there are four full-page reproductions of Countess Zichy's paintings.

CHARLES C. CLARE, JR.

AMERICAN ROSE ANNUAL, 1961. Gurney, James P., editor. 243 pages, illustrated, 20 color plates. American Rose Society, Columbus, 14, Ohio. $4.50.

Twenty-five articles in this yearbook span the wide interests of rose fanciers, covering such subjects as fundamentals of growing roses, use of roses in the home landscape, pest and disease control, and hybridizing. Over one hundred and eighty old roses have been rated as to quality by a special committee. Recently introduced roses are also rated, with exhaustive comments from growers across the country, in the ever-popular "Proof of the Pudding" section.

B. L. Wagenknecht of the Arnold Arboretum produces evidence that whereas the original "yellow rose of Texas" could have been either *Rosa bracteata* or *R. spinosissima*, the plants known by this name in the Southwest are either *Potentilla glandulosa* or the double-flowered *Kerria japonica*.

PAUL F. FRESE
White Plains, New York

REVIEWS OF RECENT BOTANICAL BOOKS

THE NATIVE ORCHIDS OF TRINIDAD AND TOBAGO. Schultes, Richard Evans. 275 pages, illustrated, indexed. Pergamon Press Inc., New York. 1960. $15.00.

The Native Orchids of Trinidad and Tobago, adds another volume to the flora of that area. The government has been publishing this series over some thirty years, family by family. One reads that only seven per cent of the flora is endemic to Trinidad and Tobago. The rest is in common with that of northern South America, particularly Venezuela and the Guianas, with which the islands have geological connections. There are 181 orchid species of 66 genera included, and the bulk of the book is devoted to their description. Competing for first rank with orchids in the flora are 183 species of grasses and 172 species of legumes. All other families represented in the flora have many fewer species, an interesting situation to those concerned with speciation.

The book begins with a section on general considerations of the orchid family, which is compounded of the usual botanical information and brief items of interest, the whole strongly flavored by the publications of Oakes Ames. This is not surprising. Dr. Schultes, now curator of the Botanical Museum of Harvard University, and the author of this fine book, was one of Ames' outstanding students. He points out, "The only single character that can serve to separate the *Orchidaceae* from all other families is the absence in the embryo of a root."

The next section of the book is an excellent account of the topography of the islands and the history of orchid collecting in Trinidad and Tobago. Many items of note about early orchid collections and orchid collectors are included, and one can't help wishing that similar history and short biography were available for other regions of orchid interest in the world. One enjoys, for instance, "David Lockhart served as the first Superintendent of the Botanic Gardens in Trinidad from 1818 to his death in 1846... His name was commemorated by John Lindley in the beautiful orchid-genus *Lockhartia*." And, "Tobago is thought to be the island to which Daniel Defoe referred as Robinson Crusoe's home, and the name of the island traces back to the Karib word that has survived as our modern term 'tobacco'."

The key to the genera is strictly dichotomous, objective, and does not make use of obscure diagnostic points. It worked out well for the two or three species I ran through it. The descriptions of species are complete for the botanist and would definitely help the advanced amateur interested in more technical aspects of orchid identification. Flowering season and distribution of the orchid plants other than on these two islands is noted. The derivation of generic names is also included, an interesting departure from the usual.

(Continued on page 191)

MEMBERSHIP

We were delighted to welcome the following new members between April 1, 1961, and July 1, 1961.

NEW MEMBERS

Life Member

Mrs. Marvin L. Levy

Contributing

Miss S. D. Bliss*
William F. Wilkinson*

Husband and Wife

Dr. & Mrs. Harold E. Anthony
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Mr. and Mrs. John J. Blum
Dr. & Mrs. Robert G. Brayton
Mr. and Mrs. James B. Campbell
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Mr. and Mrs. Leo Charwat
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Mrs. John E. Woodridge
Joseph P. Yagodzinski
Robert Yakel

*Change in Membership Classification

NEWS, NOTES and COMMENTS

Gifts to the Garden. Under the will of Mrs. George W. Perkins, a fund was set aside for charitable gifts. As Mrs. Perkins' interest in The New York Botanical Garden was of long standing, her executors selected the Garden to share in this fund to the extent of $10,000.

Gilbert H. Montague, "in memory of [his] deceased wife, Amy Angell Collier Montague, and in commemoration of [his] many friends who are or were during their lifetime interested in The New York Botanical Garden, particularly Harriet Barnes Pratt, Maud Cowham Senior, Margaret McGrath Rockefeller, Blanche Ferry Hooker, William J. Robbins, Joseph R. Swan, Charles B. Harding, Henry F. duPont, and Edwin de T. Bechtel" bequeathed to the Garden the sum of $25,000 and certain books, prints, plates, pictures, and pamphlets relating to horticulture and floriculture.

Mrs. William S. Paley presented a Roover-Lotsch labeling machine to the Horticultural Department.

Gifts to the Library. Among the sixty-three volumes bequeathed to the Garden by Gilbert H. Montague are these rare items: *Temple of Flora* by R. J. Thornton, London, 1812, in the original leather binding. (The Library has a 1799 edition); *The English Herbal, or History of Plants* by William Salmon, London, 1750. (The Library has a 1710-11 edition); *Maison Rustique or, The Countrie Farm* compiled by Charles Stevens and John Liebault and translated by Richard Surflet, London, 1600. (The Library has a 1606 edition); *Collection Precieuse et Enlumince des Flora,* two volumes, by M. Buchoz, Paris, eighteenth century; *Plantae Selectae* by Georgius Dionysius Ehret and Christophorous Jacobus Trew, Nuremberg, 1750; *English Botany;* or, *Coloured Figures of British Plants,* thirty-six volumes, by James Edward Smith, with figures by James Sowerby. London, 1814; and *Les Roses,* three volumes, after P. J. Redouté by C. A. Thory, Paris, 1828.

Mrs. Stephen G. Cutting presented Mr. Cutting's library, representing seventy-five horticultural titles, to the Garden. Mr. Cutting, a former student-gardener and an instructor in the Educational Program, died suddenly this past spring. At the time of his death he was Horticulturist at the School of Forestry Research of Yale University.

Mrs. Elliott Averett, a member of the Advisory Council, presented Volumes 5-38 of the *American Horticultural Magazine* and a number of yearbooks of the American Daffodil Society to the Library.

Oakleigh Thorne, a member of the Board of Managers, presented 191 volumes from the library of his grandmother, Mrs. Oakleigh Thorne, to the Garden. Mrs. Thorne, who died in November, 1952, at the age of eighty-seven, was a member of The New York Botanical Garden and Honorary Vice President of The Garden Club of America from 1933-52, and played a prominent part in conservation projects, especially in the redwood groves of California.

The volumes, many of which are "association" copies—presentation copies from the author to Mrs. Thorne—reflect her interest in California native flora and California gardens, in Japanese landscape gardening, in English and Italian gardening, as well as in American horticulture. Several beautifully illustrated volumes are devoted to wrought-iron work. Some of the books are duplicates of those already in the Library, but the Garden welcomes duplicates as they enable the Library to satisfy more than one request at a time for a particular book.

Three copies of *Glory of the Wayside* by Torkel Korling were presented to the Library by the publisher, Lakeside Press, and a folio of flower plates in color was presented by the Container Corporation of America.

Elected to Board of Managers. Mrs. Arthur Hays Sulzberger and Michael Rapuano have been elected to the Board of Managers of The

New York Botanical Garden.

Mrs. Sulzberger, well-known for her civic and educational interests, is a trustee of Barnard College, her alma mater, and the University of Chattanooga, where she received a doctorate of law. She also serves on the Board of Governors of Hebrew Union College and is Vice President of the Board of Directors of the Girl Scout Council of Greater New York, Inc. Mrs. Sulzberger is a trustee of the Association of American Indian Affairs and Chairman of the Board of the Park Association of New York City, Inc.

Michael Rapuano, one of the country's leading landscape architects, is President of the American Academy in Rome and was appointed to the Commission of Fine Arts in Washington, D. C., by President Eisenhower in 1958. He is a Fellow of the American Society of Landscape Architects, an associate of the National Academy of Design, a member of the National Institute of Arts and Letters, and served on the Art Commission of the City of New York for many years. As a partner of Clarke and Rapuano, consulting engineers and landscape architects, he has been responsible for large projects across the country and in Canada, including highway and parkway systems, urban renewals, public parks, and industrial landscaping. Mr. Rapuano acts as consultant for the Philadelphia City Planning Commission and a number of universities, including Princeton, Vanderbilt, Lehigh, Wesleyan, and Indiana.

Activities of the Director and Staff. Within the past few months, Dr. William C. Steere, Director, attended the fiftieth anniversary of The New York Public Library, New York City, celebrated by a re-dedication of its quarters and an academic procession and luncheon; a meeting in Washington, D. C., of the Special Facilities Panel of the National Science Foundation; a meeting, also in Washington, D. C., to plan for a conference of Latin-American biological editors. He also visited the Mountain Lake Biological Station of the University of Virginia. Dr. Steere spent five weeks in Alaska in field work on mosses, under a grant from the Arctic Institute of North America. He was stationed at Point Barrow. Dr. Steere presented a paper on "Patterns of Geographical Distribution of Alaskan Bryophytes" at the Tenth Pacific Science Congress held in Honolulu, Hawaii.

Dr. Pierre Dansereau, returned the latter part of September from New Zealand, where he had been engaged in field work for the past four months, to assume his responsibilities as Assistant Director (Botany). Enroute from New Zealand, he stopped at Honolulu, Hawaii, where he attended the Tenth Pacific Science Congress.

T. H. Everett, Assistant Director (Horticulture) and Senior Curator of Education, Elizabeth Hall, Sarah Gildersleeve Fife Research Librarian, Dr. Julian A. Steyermark of the *Instituto Botánico* of Caracas, Venezuela, and Frank P. Knight, Director of the Royal Horticultural Society's Gardens, at Wisley, England, were guests of the Hon. Thomas C. Desmond and Mrs. Desmond at their home in Newburgh, New York. Dr. Steyermark and Mr Knight appreciated this opportunity of viewing the fine specimens in the Desmond Arboretum. Mr. Desmond is a member of the Board of Managers of The New York Botanical Garden.

Mr. Everett and Vincent Rampino, Superintendent of Buildings and Grounds, visited the Missouri Botanical Garden at St. Louis, Missouri, and Garfield Park and Lincoln Park in Chicago, Illinois. Mr. Rampino later visited the rose garden at Hershey, the rose nursery of Conard-Pyle Co., at West Grove, and Longwood Gardens at Kennett Square, all in Pennsylvania.

Miss Hall guided thirty-nine members of the Garden Club of Englewood, New Jersey, on a tour of the Garden; lectured on herbs before the Pound Ridge Garden Club at a meeting held at the home of Mrs. Mortimer J. Fox, Mt. Kisco, New York; attended the four-day activities of the Herb Society of America, visiting herb gardens on Long Island and in Westchester County, New York, and lecturing on herbs and books at the herb dinner held at the Lawrence (Long Island) Beach Club.

Dr. Bassett Maguire, Head Curator and Coordinator of Tropical Botany, attended the F A O Conference held in Rome, Italy, July 10-20, 1961. The object of this conference was to promote international cooperation in plant introduction through botanical gardens and institutions interested in exploration and taxonomic work. Dr. Maguire and Mrs. Maguire departed August 15, 1961, for six weeks in British Guiana.

Dr. Arthur Cronquist, Curator, and Dr. Richard M. Klein, Alfred H. Caspary Curator, presented a paper on "Porphyrins in Evolution" before the American Society of Plant Taxonomists during the meetings of the American Institute of Biological Sciences at Purdue University, Lafayette, Indiana, August 27-31, 1961. Dr. Klein also moderated the symposium on "Differentiation in Cell Cultures" for the Botanical Society of America during these A.I.B.S. meetings.

Dr. David J. Rogers, Curator of Economic Botany, attended a symposium on communications in science in Washington, D. C., June 19 to July 1, 1961, at the invitation of the American Institute of Biological Sciences.

Dr. Clark T. Rogerson, Curator of the Cryptogamic Herbarium, attended the Charles Horton Peck foray at Allegheny State Park in western New York State. He collected specimens of the order Hypocreales at Highlands Bilological Station in Highlands, North Carolina, in July and August, and attended the meetings of the American Institute of Biological Sciences held at Purdue University, Lafayette, Indiana, the latter part of that month.

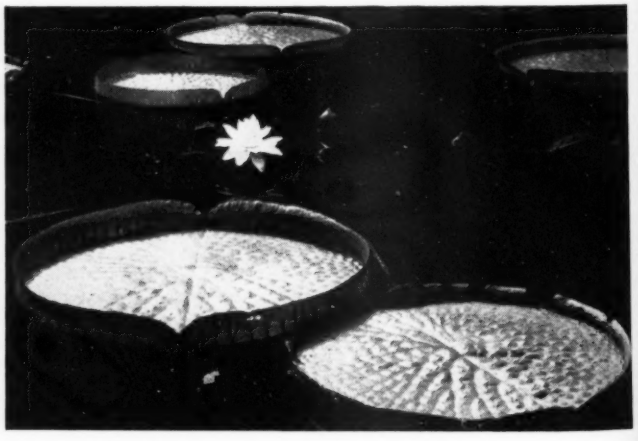
Dr. Ronald Petersen worked in Dr. Rogerson's laboratory for seven weeks the early part of this summer. He received his Ph.D. from Columbia University on June 6, 1961: his doctorate thesis was entitled "The Aquatic Hyphomycetes of Eastern North America." Dr. Petersen spent the latter part of the summer at Highlands Biological Station in Highlands, North Carolina, collecting members of the *Clavariaceae,* or coral fungi, under a grant from the National Science Foundation.

Dr. Alma Barksdale, Research Associate, returned to the Research Laboratory on August 8, 1961, from Japan where she had spent the past year in collecting and studying water molds from Japanese lakes. Dr. Barksdale's headquarters were in the Department of Botany, Kyoto University.

Dr. Howard Irwin, Research Associate, left for Amapá, Brazil, in late June. He was joined in July by George Irvine and Robert King, graduate students, for field work in that area. Mr. King, however, returned to this country because of illness.

Frank C. MacKeever, Custodian of the Herbarium, spent two weeks in plant collecting on Nantucket Island. Mr. MacKeever believes he has found three species new to Nantucket Island, two new to Martha's Vineyard.

Louis P. Politi, Horticulturist, attended a



Victoria cruziana was first grown at The New York Botanical Garden in 1936, in the then recently remodeled tropical house of the Conservatory. The plant, which was placed in the indoor pool in mid-May, grew rapidly and flowered in early August.

The late William Tricker of water-lily fame introduced *V. cruziana* in 1894. It is a native of the Paraná River and its tributaries in Paraguay. This species has huge, floating leaves which are two to four-feet wide, not as large, however, as the leaves of *V. regia,* which are sometimes as much as six feet across. *V. cruziana* is hardier than *V. regia* and can be grown in outdoor pools if the temperature of the water is not less than 75°.

The Garden grew *V. cruziana* this past summer in the pool in House 10 of the Conservatory and in the pool in the Conservatory Courtyard. Both specimens flowered and attracted considerable attention.

meeting of the American Rhododendron Society, held on the former W. R. Coe estate at Oyster Bay, Long Island. This estate is now an adjunct of the Long Island Technical and Agricultural Institute at Farmingdale. Mr. Politi sent trusses of rhododendrons to the rhododendron show held in the Trailside Museum of Watchung Reservation, Union County, New Jersey. Dr. Harold N. Moldenke, Director of the Museum and a former staff member of The New York Botanical Garden, was most appreciative of this cooperation.

Dorothy Ebel Hansell, Editor of *The Garden Journal*, was re-elected director of the American Rock Garden Society, and selected to be a judge of the photo contest being sponsored by Old Westbury Gardens. Mrs. Hansell will edit the Proceedings of the Sixteenth Annual American Horticultural Congress to be held in Northampton, Massachusetts, October 25-27, 1961.

A new Genus, *Maguiriothamnus*. Dr. Julian A. Steyermark's research on tropical members of the *Rubiaceae* began with the genus *Gleasonia*, endemic to the sandstone table mountains of Venezuela. This summer he dedicated to Dr. Bassett Maguire a new genus that he isolated and named *Maguiriothamnus* in his honor. Dr. Steyermark returned to the *Instituto Botánico* in Caracas, Venezuela, after spending several months in research on Guayana members of the *Rubiaceae* collected by expeditions of The New York Botanical Garden.

The Herb Society of America held a four-day meeting in the New York area during the latter part of June, 1961. They visited the Herb Garden of The New York Botanical Garden on June 22. Then, joined by Mr. Everett, Miss Hall, Mr. Politi, and Miss McSweeney, Assistant to the Horticulturist, they visited the herb gardens of Mrs. Mortimer J. Fox at Mt. Kisco and Mrs. Oliver Capen at Bedford, New York.

Visitors to the Garden. During recent months the following have visited the New York Botanical Garden:

Dr. Roberta Ma, U. S. Department of Agriculture, Washington, D. C.

Frank Knight, Director, Royal Horticultural Society's Gardens, Wisley, England.

Dr. B. M. Johri, University of Delhi, Delhi, India.

Prof. John Purseglove, Dean of the School of Agriculture and Head of the Department of Botany, Trinidad.

Stanley Smith, Curator of Herbarium, New York State Museum, Albany, N. Y.

C. Weisel, Pullman, Washington.

Mrs. S. Bird, Greensboro, N. C.

Dr. A. L. Martinez, Bureau of Plant Industry, Manila, Philippines.

Dr. E. J. Smith, Dept. of Medicine, College of Physicians and Surgeons, Columbia University, New York, N. Y.

American Rose Foundation. Dr. Cynthia Westcott, Chairman of the Research Committee, reported on the grant of $3,000 to the Oregon Agricultural Experiment Station for a fundamental study of powdery mildew on roses, including an evaluation of the susceptibility of rose varieties and the testing of new fungicides and systemic chemicals for the control of mildew, rust, and blackspot. Initiated in July, 1959, for a period of three years, the grant covers the salary of a graduate research assistant, labor, supplies, and travel.

The Foundation contributes $1,000 annually for pesticide tests on roses by the United States Department of Agriculture at Beltsville, Maryland, under the direction of Dr. Floyd Smith. In cooperation with Conard-Pyle Company, large-scale field tests will be conducted for the control of thrips at the nursery in West Grove, Pennsylvania.

The Foundation contributes another $1,000 annually to the United States Department of Agriculture for a long-time period project in rose breeding.

The rose breeding program at Iowa State College has been extended in effect from 1955 to 1960, at $500 a year. Dr. Griffith Buck's part of the program is to breed extremely hardy roses that will give repeat bloom and to develop disease-resistant understock, with Dr. Lyle cooperating in field trials.

The Sixteenth Annual American Horticultural Congress will be held in Northampton, Massachusetts, October 25-28, 1961, with headquarters at the Northampton Hotel.

Registration will be at the hotel during the afternoon of October 25. The afternoon and evening have been reserved for renewing acquaintances and making new ones in a relaxed atmosphere. Thursday and Friday will be devoted to meetings, luncheons, tours, and dinners. Seven outstanding speakers will gear their talks to the general theme of "Horticultural Advances to Aid the Gardener." Dr. William C. Steere, Director of The New York Botanical Garden, will reveal how "Science Lends a Hand to the Busy Gardener."

The Smith College Botanic Garden will be on one of the tours; here is assembled the best collection of rock garden plants in New England. Two important commercial greenhouse establishments will also be visited, as will the Chrysanthemum Show staged by the horticultural students of the University of Massachusetts at Amherst.

Congress attendants will be interested in the Arcadia Wild Life Preserve, a large area administered by the Massachusetts Audubon Society where over two hundred species of birds have been recorded, and in the privately endowed park on the outskirts of Northampton. A former farm, given to the City in 1928 by Mrs. Fannie Burr in memory of her husband, Frank Newhall Cooke, has been developed into a very popular park and recreation center with funds provided by the donor. Funds for its upkeep are provided by a trust fund set up solely for this purpose so that no funds are required from tax sources—a plan all too rare in the parks of America.

Progress in the Synthesis of R N A. Dr. Jerard Hurwitz, of New York University Medical Center, described the synthesis, in a test tube, of the basic chemical that directs the making of proteins in all living things. Dr. Hurwitz presented his paper on June 7, 1961, at

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Cold Spring Harbor, Long Island, at the annual symposium on quantative biology sponsored by the Biological Laboratory of the Long Island Biological Association.

The chemical is a form of ribonucleic acid, known as RNA, which has recently been found to serve as the transmitter of information in deoxyribonucleic acid or DNA. the substance which controls heredity.

Dr. Hurwitz's accomplishment was compared by scientists at the symposium to the studies of DNA by Dr. Arthur Kornberg and his associates at Stanford University. Dr. Kornberg's work was mentioned in the article, "The Gene—1960 Model," in the July-August issue of *The Garden Journal*.

Dr. Hurwitz, a brother of Mrs. Sylvia Schulman, who is secretary to the Editor of *The Garden Journal*, presented a paper at the International Biochemical Congress in Moscow, U. S. S. R., August 10-17, 1961.

Flower Show School, Course I, of the Ninth District of the Federated Garden Clubs of New York State, Inc., will be held October 4, 5, and 6, 1961, at Memorial Methodist Church, White Plains, New York. Mrs. Milton A. Hescock, who will instruct in flower show practice, is a National Council accredited instructor and judge, a life member of the State Federation, a past chairman of several flower show schools, and a past president of the Garden Club of Mamaroneck, New York.

Dr. Robert E. Lee, Associate Professor of Floriculture at Cornell University, will teach basic horticulture. He has written several bulletins published by the University and is coauthor of *Contemporary Perennials* by Cumming and Lee, published by Macmillan Co. He is accredited by the National Council of Federated Garden Clubs to teach Courses I-V.

Mrs. Loren R. Dodson of Old Lyme, Connecticut, and Naples, Florida, will teach principles of art and types of design in flower arrangement. She is the author of *An Easy Guide to Color for Flower Arrangers,* a National Council accredited judge, and a well-known flower arranger and lecturer. In April 1950 Mrs. Dodson organized and presented under her direction the first course of the Flower Show School given in the Ninth District. Mrs. William F. Frank of New Rochelle, New York, is the Flower Show School Chairman; Mrs. Charles Hoffman, Scarsdale, New York, is the Honorary Advisor. Further details may be had by writing Mrs. Arthur G. Steinmetz, Publicity Chairman, 125 Shore Drive, Port Chester, New York, for the show brochure.

LETTERS TO THE EDITOR

Your mention of the American Iris Society in the May-June issue of *The Garden Journal* interested me. When I lived in Pelham, New York, 1898-1915, I had a large collection—about thirty varieties then called "German" iris. Nurseries were scarce in those days. Some of my iris came from Dr. Nathaniel Lord Britton.

Since the death of Richard Britton, Dr. Britton's brother, I believe I am the last surviving relative. Our mothers were cousins, and the families were intimate on Staten Island.

I can't raise beautiful iris or other northern flowers here. Temperate-zone horticulture is rather an aggravation in the subtropics.

Perhaps you may also be interested to learn how we, my sister and I, got a large collection of hardy perennials back in 1898.

George W. Park, seedsman of La Park (?) Pennsylvania, used to publish *Park's Floral Guide*, a modest little magazine which evidently reached farm households pretty thoroughly throughout the country in the 1880's and 1890's. As I recall, it was ten cents a year, twenty-five cents for three years. It had a tremendous circulation and, as I remember, carried no advertisements except of flowers.

It carried a column of exchanges, and we put in an advertisement to exchange begonias and other house plants for hardy perennials. We had just moved to the country from Harlem, New York City, where we had grown nice house plants. Our little advertisement had good response—we received answers from all over the country, Florida to Canada, and we quickly acquired a very large collection of all sorts of old-fashioned flowers for our new garden. I remember getting iris, bleeding-heart, phlox, rocket, valerian, peonies, spiraea, honesty. After sixty-three years, I've forgotten the rest.

Yes! It's true that nurseries were not common in those days, and money was not plentiful, but within a few years we had a good garden.

Mr. Park's sons still carry on the seed business—it's now located in South Carolina. They were pleased to hear from me several years ago when I wrote to tell them of the success I had had because of their father's magazine.

Thank you for inquiring about the book on cycads—I have a collection of over forty species, and want the book for reference. I have Chamberlain's *The Living Cycads*, but this new book is said to be more complete.

LAWRENCE M. SIMONSON, M.D.
Lantana, Florida

I do want to thank Dr. Steere and the staff of The New York Botanical Garden for all they did for the American Iris Society meeting on May 26, 1961. As a charter member and for many years a director, I remember the real entente between the A. I. S. and the Garden. As the chairman of all the A. I. S. test gardens for a long time, I know that hundreds, in fact, thousands of plants went out from the test garden at The New York Botanical Garden to establish and enlarge other A. I. S. test gardens. The one at Ames, Iowa, was actually a large and very complete one in two years from the divisions sent from here. This included all that

Below. Dr. John C. Wister, Director of the Arthur Hoyt Scott Horticultural Foundation of Swarthmore College, Mrs. Ethel Anson S. Peckham, and Dr. Henry A. Gleason, Curator Emeritus of The New York Botanical Garden, met at the Garden on May 26, 1961. Right. Mrs. Peckham cuts the birthday cake at the forty-first anniversary of the founding of the American Iris Society at the Garden. Dr. William C. Steere, Director, stands at right.

was available from Dr. Small's collections and all that could be spared from the borders and rock garden. Many extra catalogues also went to Ames.

I should have mentioned John Borin as my top gardening help in everything that was dug and planted whether irises, narcissi, or any other bulbs. [Mr. Borin is now the foreman of the Conservatory.]

It was really wonderful to see how, under all the difficulties and complications of the "Reconstruction," everybody flew around and did everything to be ready in time today in the best possible way. The women, the men, all of them, and with so many interruptions and amid such banging by the contractors' workmen.

It was such a pleasure to see Dr. Gleason again, who always turned in and helped me in any emergency. I couldn't help thinking that Dr. and Mrs. Britton, Dr. Dodge, Dr. Small, Dr. Barnhart, Dr. Harper, and Dr. Stout would have appreciated what you all were doing. The best parts of my long life have been with plants and the people connected with them whether botanists, horticulturists, conservationists, ornithologists, mycologists, not to forget the researchers, the librarians, the geologists.

ETHEL ANSON S. PECKHAM
Sloatsburg, New York

Would like you to know I won a first in our Garden Club of Lawrence flower show with the 'Texas Gold' parrot tulips you sent last year. I beat out quite a few older excellent gardeners whose tulips weren't anywhere near the size and beauty of mine. Have recommended you to several members of our club.

MRS. MARTIN HORNER
Lawrence, Long Island

BOOKLETS

***Catalog of Hardy Trees and Shrubs*, a list of the woody plants grown outdoors at the Garden in 1942. Illus. Price 75¢ per copy.**

***Hardy Ferns and Their Culture*. Illus. Price 25¢ per copy.**

***Flora of the Unicorn Tapestries*. Illus. Price 25¢ per copy.**

***Food and Drug Plants of the North American Indians*. Price 25¢ per copy.**

***Montgomery Conifer Collection*, non-technical descriptions of conifers with information on history, habitat, and usage. Illus. Price 50¢ per copy.**

***Plants of the Holy Scriptures*. Price 25¢ per copy.**

***Succulent Plants of New and Old World Deserts*. Illus. Price 50¢ per copy.**

***Vegetables and Fruits for the Home Garden*. Price 25¢ per copy.**

Also reprints of well-illustrated, step-by-step articles on different garden techniques, written and photographed by T. H. Everett, Assistant Director (Horticulture): "Lawn Verges," "How to Force Dutch Bulbs" (in the home), "Some Sources of Humus," "Tree Pruning Pointers," "Sowing Seeds in Flats," "How to Transplant," "Some Fall Gardening Work" (i.e. heeling in, root cuttings, bulbs in pebbles), "Winter Protection of Plants."

10¢ each — any 6 reprints 50¢

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THE NEW YORK BOTANICAL GARDEN

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BOOK REVIEWS (Continued from page 186)

Although the Trinidad-Tobago countryside is well described in the introduction, it is too bad more information on the specific growing conditions of different species was not included. Not only would it have been interesting to study, but the book would have greater value for the amateur and horticulturist if it covered more ecological material.

There are a number of fine illustrations, some of which have not been published before. But it is a little disappointing to find that many have been used in other publications with which the Ames Orchid Herbarium has been associated. One slip-up is that the close-up of *Stelis muscifera* opposite page 70 is not that, but the same close-up of *Pleurothallis diffusa* found opposite page 78.

Generally speaking, the book is a detailed, complete, and thorough treatment of the orchids of Trinidad and Tobago. It is a very careful work, can be recommended without hesitation, and will be an excellent source of information for botanists and horticulturists for years to come.

CARL L. WITHNER
Department of Biology
Brooklyn College, and
Curator, Orchid Collection
Brooklyn Botanic Garden

VISTAS IN BOTANY. Turrill, W. B., Ed. 547 pages, illustrated, indexed. Pergamon Press, Inc., New York, N. Y. 1959. $17.50.

The two hundred years of the Royal Botanic Gardens at Kew are appropriately commemorated by a volume of "vistas"—a title that recalls the lovely vistas along avenues of fine trees well known to visitors in those gardens. Moreover, with the rapid widening and deepening of botany in all its specialities, with the explosion of botanical publication, some sort of view over the whole region is (as B. L. T. used to say) "essential if not necessary." In planning and editing this book, Dr. Turrill, formerly keeper of the herbarium at Kew, tried to include every major aspect of botany. Taxonomy has been the major preoccupation at Kew these two hundred years, but the opening of the Jodrell laboratory in 1876 brought morphology, anatomy, and other disciplines into the picture; present plans include physiology and cytogenetics. Accordingly, we find chapters here on taxonony, anatomy, biochemistry, ecology, plant sociology and geography, paleobotany, physiology, cytology, evolution, and on the major groups of plants including even bacteria and viruses. A useful list of references is appended to each chapter.

Many of the writers of these chapters, however, direct their specialties to the uses of taxonomy; this is evident, for instance, in C. R. Metcalfe's treatment of plant anatomy. Even the biochemist, E. C. Bate-Smith of Cambridge, discusses the chemical identities of species and their bearing on evolution. In fact, one may say that these vistas demonstrate that taxonomy has emerged from the herbarium and has summoned all the other botanologies to its aid.

The chapter on cytology by D. G. Catcheside of Birmingham is purely descriptive. In a way it serves as introduction to G. L. Stebbins' discussion of evolution, which includes our various sources of information and the processes involved —mutation, hybridization, polyploidy, etc.—all presented with great clarity and a refreshing lack of speculation.

The several chapters on the groups of plants—from viruses to gymnosperms—are vistas as different, naturally, as the plants that line them. But the discussions are largely devoted to history and classification. It is unfortunate that the angiosperms do not have a chapter to themselves, but are considered as sufficiently treated by H. J. Lam of Leiden in his chapter on "Taxonomy: general principles and angiosperms." We are thus not brought up to date on the morphology of this group. Dr. Lam is much concerned with the philosophy and terminology of taxonomy, but gives little attention to the modern cytological and genetic attack. Though sceptical of all conclusions on phylogeny not supported by fossils, Lam himself indulges in considerable phylogenetic speculation.

Three chapters give a comprehensive view over floristics and ecology. Sir E. J. Salisbury, former Director of Kew, emphasizes the complexity of ecological factors, our lack of exact information on many of them, and the misleading effects of considering isolated agencies. Dr. J. Braun-Blanquet continues with plant sociology (the only chapter not in English), reviewing the methods of description, analysis, and classification of the units of vegetation (with many diagrams). Dr. Turrill writes on plant geography, its history and its modern concepts,

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with a review of the vegetational realms and regions.

The last chapter is an account of plant physiology by F. W. Went, the brevity of which perhaps testifies to the lack of this particular vista in modern taxonomy.

In spite of obvious gaps, this is a very useful view over botany, both historical and descriptive, for the teacher and for the researcher who would like to keep up with other specialties than his own.

H. W. RICKETT

THE PINEAPPLE. J. L. Collins. xvii + 294 pages illustrated, bibliography, indexed. Interscience Publishers, Inc., New York, 1960. $9.75.

The Pineapple follows the general pattern of other books in the World Crop Series, divided into three parts: Botany, Cultivation, and Utilization. The author is an outstanding authority on the pineapple, having spent most of his career in the scientific study of this tropical crop, largely in Hawaii.

The name pineapple usually refers to *Ananas comosus*, except in those countries where related species, and the genus *Pseudananas*, are native. Though this fruit was apparently used by the native Indians of tropical America for centuries, it did not become known to European civilizations until the sixteenth century, and became important as a food crop only in the twentieth century when a Hawaiian engineer developed a rapid mechanical means of pealing and preparing the fruit for canning. There was considerable interest in the fruit in Europe in the eighteenth and nineteenth centuries; many noblemen raised the pineapple in glasshouses as a curiosity. Indeed, the most generally used variety, the Cayenne, became well known and was distributed from the glasshouses of Versailles.

The point or points of origin of the pineapple have not been pinpointed with any exactitude, no more that that of any other modern cultivated plants. Some concur in the opinion that the fruit originated in southern or south-central Brazil.

The history, the origin, the botany, and other aspects of the scientific study of this member of the *Bromeliaceae* are very well written. The author has a pleasing, open style which enhances the fascinating story of the plant. The development of the multiple fruit (a botanical term) is very interesting and offers a tool for students interested in morphological differentiation. The description is clear and, although the reviewer is not a specialist in this group, seems accurate in interpretation.

Under "cultural methods" are models for tropical agricultural procedures. Many advanced techniques of intensive agricultural production are employed in Hawaiian plantations—strip-paper mulching, soil fumigation, foliar spraying, and so on. Differing conditions for the eleven major-producing regions of the world are described. One minor-producing area in the Azores is discussed because of its unusual methods.

In Part III, Utilization, details of processing fresh and preserved fruit show the same remarkable integration as was shown in the chapters on cultivation. In order to utilize the greatest amount of the fruit, its parts have been studied intensively for various types of products. One section, prepared by R. M. Heinicke, deals with by-products of the pineapple plant.

DAVID J. ROGERS

REGIONS, RESOURCES, AND ECONOMIC GROWTH. Perloff, Harvey S., E. S. Dunn, Jr., E. E. Lampard, and R. F. Muth. 716 pages, illustrated, indexed. The John Hopkins Press, Baltimore, Md. 1960. $12.00.

One finds little direct discussion of plants in this volume, a detailed economic analysis of natural resources in the United States. The authors are economists or historians, and their concern is that of the relations of all our natural resources with the historical development of the country. They trace the growth and redistribution of population, productive activities, and personal income that developed between 1870 and 1910 (Chapters 1-9). Then in Chapters 10-18 regional economic developments from 1870-1950 are discussed. Chapters 19-26 follow the regional distribution of economic activities in the United States, 1939-1954. The last set of chapters, 27-34, discusses variations in levels and rates of growth of per capita income.

A comprehensive statistical index, giving source notes, tabular material on labor force by states, value of extractive resources, and so on, closes this scholarly book.

DAVID J. ROGERS

ADVANCES IN PEST CONTROL RESEARCH. Metcalf, R. L., Ed., Vol. 4, 347 pages illustrated, indexed, bibliography. Interscience Publishers, Inc., New York, N. Y. 1961. $12.50.

This is fourth in a series designed to stimulate new lines of research, and to be a continuing reference work for the research worker, the teacher, and the student in the field of pest control. Among the subjects treated are: applied insect pathology, aquatic plant control, and chemical control of insect pests of domestic animals. Nearly one hundred pages are devoted to a digest of the available information on the insecticide malathion, with 658 references in the bibliography.

P. P. PIRONE

THE USE OF CHEMICALS IN SOUTHERN FORESTS. McDermid, Robert W., Ed., 152 pages, illustrated. Louisiana State University Press, Baton Rouge, La. $4.00.

Three phases of forest management—fertilization, use of chemical weed killers, and use of fungicides and insecticides—are treated in considerable detail in these papers presented at the Ninth Annual Forestry Symposium at Louisiana State University. One of the most interesting chapters discusses legal problems connected with widespread application of such chemicals as 2,4-D and 2,4-5T. This is a book for foresters and closely related professions.

P. P. PIRONE

HERBICIDES AND THE SOIL. Woodford, E. K., and G. R. Sagar, Editors. 88 pages, illustrated. Blackwell Scientific Publications, Oxford, England. 1960. $3.50.

This small, paper-bound book carries four papers presented at the second symposium organized by the British Weed Control Council: Microbial breakdown of herbicides in soil, effect

of herbicides on soil micro-organisms, physico-chemical aspects of the availability of herbicides in soils, and the persistence of some important herbicides in the soil.

P. P. PIRONE

THE MOLDS AND MAN. Christensen, Clyde M. 2nd ed., revised. 238 pages, 14 plates. University of Minnesota Press, Minneapolis, Minn. 1961. Paper $1.75; cloth $4.75.

Dr. Christensen's introduction to the fungi continues to be the best of those written in a popular style. In the revised edition the discussion on fungi in foods and building materials has been brought up-to-date. A chapter on experiments with fungi has been added. Unfortunately, the appendix on classification of the fungi has been deleted in the revision. Ten good black and white photographic illustrations have been added. The book should have wide appeal for beginners in the study of fungi.

CLARK T. ROGERSON

MONOGRAPH OF MONOCHAETIA AND PESTALOTIA. Guba, Emil F. 342 pages, illustrated, indexed. Harvard University Press, Cambridge, Mass. 1961. $10.00.

The genera *Monochaetia* and *Pestalotia* include asexual fungi usually found on dead plant material, but which occasionally occur as plant parasites. A monograph of such groups must necessarily be technical in nature, and hence is often not attractive to the non-professional. Complete with keys to the species, host indices, synonymy, illustrations, and descriptions, Guba's monograph will serve as a valuable reference work on the group. Several minor flaws appear, chief among which is the inclusion of several species under a single choice of the key. However, differences in species is amply shown in their descriptions. Nomenclature opinion is used whenever necessary, not always to the clearest or most acceptable end. Definitely not the gardener's cup of tea, the work remains an invaluable aid to the professional mycologist.

RONALD H. PETERSEN

Two station wagons—six men in the first, five in the second—slowed down, then came to a halt across the street and looked toward our house. What could they want?

A man stepped from each car, crossed the street, entered our driveway, and stopped. I should have known what they were looking at—the tulips. And not only looking at them but measuring them and signaling the sizes to their companions in the station wagons.

Darwin Hybrid 'Holland's Glorie' stood thirty-four inches tall—all twelve exactly the same height—and carried five-inch cups on their strong, straight stems. Darwin Hybrids 'Gudoshik' and 'Roosevelt' had slightly smaller flowers—they were four and a half inches—on equally strong, straight stems thirty-two inches tall.

'Niphetos' was lovely, so were 'Golden Age' and 'Zwanenburg'.

As for narcissi, 'Duke of Windsor', 'Golden Torch', and 'Fermoy' made quite a showing.

Your bulbs are wonderful! Our neighbors raved about them, too. E. R. H.

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